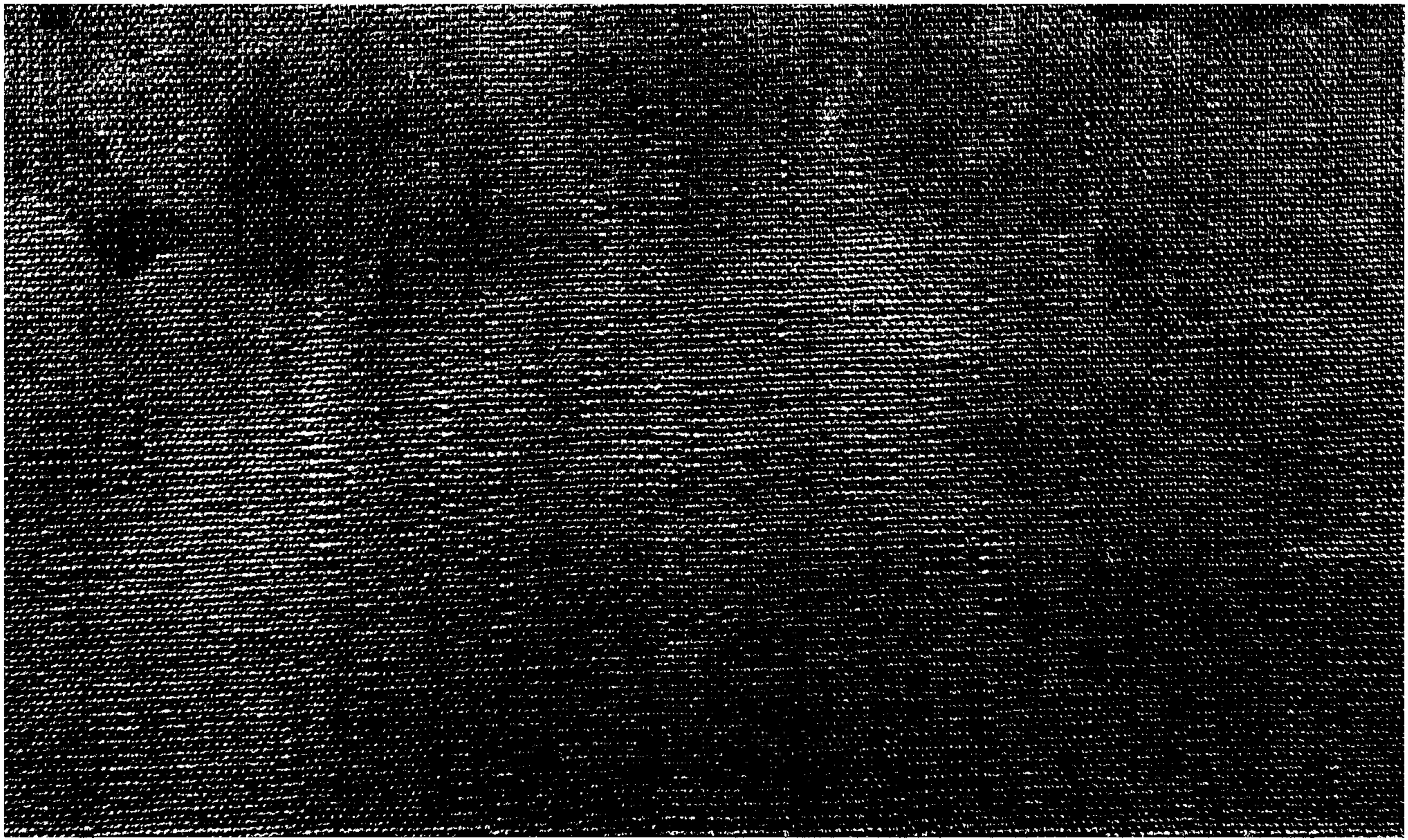

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OF

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JOURNAL

OF

The New York Botanical Garden

EDITOR

PERCY WILSON

Docent

VOLUME XI

WITH 7 PLATES AND 42 FIGURES

1910

PUBLISHED FOR THE GARDEN

AT 41 NORTH QUEEN STREET, LANCASTER, PA.

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Administrative Assistant

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VOL. XI January, 1910. No. 121.

DEATH OF MR. DARIUS OGDEN MILLS, PRESIDENT OF THE BOARD OF MANAGERS.

It is with deep sorrow that we record the death of Mr. Darius Ogden Mills, on Monday, January 3, 1910, at his winter home, Millbrae, San Mateo County, California.

At the annual meeting of the New York Botanical Garden, held January 10, 1910, the following tribute to his memory was ordered entered upon the minutes :

Mr. Darius Ogden Mills has served the New York Botanical Garden as President of the Board of Managers since February, 1898. He was one of the original incorporators named in the Charter of the Garden, granted by the Legislature of 1891, and earnestly worked for its foundation, contributing largely to its endowment fund. Since the organization of the Board of Managers in 1895 he has given liberally, both time and money, to its needs ; he has served, since his election as President, on the Executive Committee and on the Finance Committee, and has attended nearly every meeting of the Board or of the Committees held when he has been in New York. His advice and suggestion have been of great value ; he has given much personal attention to the development of the grounds of the Garden in Bronx Park, and to the formation of the collections there.

His services as a patron of botanical science have been very important, and his counsel was always of the wisest. His death is a grievous loss to his associates, by whom his kindly personality will never be forgotten.

Funeral services were held at St. Thomas' Church, New York, on Friday, January 14, 1910, and were attended by a delegation of the Board of Managers.

THE BRONX RIVER AT FLOOD.

The Bronx River has an average width of about 45 feet through its flood plain, the "North Meadows" of the Botanical Garden, and its present depth there at average flow is not over three feet. At freshet times the river rises rapidly nearly or quite to the level of its banks and falls again nearly as rapidly as it rose.

This flood plain is nearly level, sloping slightly southward from the north end of the Garden to the long curve in the river north of the Long Bridge, but there were a number of areas in it which were from one to three feet lower than its general surface and partly occupied by pools and marshes. As the work of developing this northern part of the grounds has proceeded, by the building of driveways and paths, a large part of these depressions have been filled up to approximately the general level, and a great deal of drain pipe leading to the river has been laid, but much still remains to be accomplished before the "North Meadows" are completely reclaimed; considerable progress has been made in this work during the past season. This flood plain is one of the most beautiful and interesting features of the Bronx River Valley, and the plan of development contemplates changing it as little as possible, otherwise than the filling and draining of the depressions above mentioned.

It is particularly suited to the growth of moisture-loving plants of all kinds. Several acres of it west of the river have already been planted with various kinds of willows (*Salicetum*), some of which are now trees of considerable size, and a path now under construction will bring these close to the pedestrian. This collection may soon be considerably increased by additional planting. The landscape design does not plan overplanting the plain, however, and large meadow areas will be retained.

The control of the river water at freshet has been a very interesting problem, which it has been sought to solve as economically as possible. Studies of flood conditions have been made for several years and records kept of high water marks under various conditions. It is undesirable to raise any portion of the plain higher than is necessary, and it is desirable, from a landscape standpoint, that it should be slightly undulating rather than

quite level. As the land-drains must of necessity outflow into the river, water backs up into them during freshets, and may temporarily flood limited low areas.

The average surface of the river is governed by the dam at the Lorillard Mansion. After careful surveys and studies this dam was lowered sixteen inches several years ago, and this resulted in reclaiming much of the marshy ground and caused flood water to pass down the valley much more rapidly than before; the river has not reached heights as great since this work was done as it did before. We thought at that time that about eight inches further lowering of the dam would be desirable, but this would futher diminish the height of the waterfall by that amount.

A typical freshet was studied from December 13 to 15, 1909. A storm commenced with snow in the early morning of December 13, changed to rain before noon and rainfall continued until late in the evening; the total precipitation measured by the rain-gauge on the museum building was 2.44 inches; the ground was slightly frozen in the morning but thawed out during the day; the river rose gradually at first, then more and more rapidly, reaching its maximum height of just about level with its banks at about five o'clock on December 14, flooding some low areas, rising in all nearly four feet in twenty-four hours; by nine o'clock in the morning of December 15 it had already fallen two feet and by five o'clock that afternoon it went down nearly another foot and nearly all the depressions were emptied again.

N. L. Britton.

REPORT ON A TRIP TO SANTO DOMINGO.

Dr. N. L. Britton, Director-in-Chief,

Sir: Acting under your instructions I left New York on October 13 for the republic of Santo Domingo. I was accompanied by Mrs. Taylor, who took charge of the drying of most of the plants collected, and also made twenty-four colored drawings of orchids and fungi. The specimens secured have all come from the provinces of Samana, Seibo and Macoris. In view of the fact that this is the first expedition of the Garden to this country,

a short sketch of the region visited will render the present account more intelligible, and serve also to put on record some facts which may be valuable to future explorers.

The three provinces mentioned above include all the eastern end of the island of Hispaniola, and judging from their sparsely settled condition they will be for some time a region of unbounded botanical possibilities. Samana, the most northeastern province of the republic, is mainly taken up with the bay of that name and a peninsula some thirty miles long and ten wide. The most important towns are Sanchez, Samana, Sabana la Mar and El Valle. The first three are all on Samana bay, probably the finest harbor in the world; and Sanchez, the most important town in the province, is the terminal of the railroad to the Cibao. Seibo, which is larger than Samana and Macoris combined, stretches from the Atlantic to the Caribbean, and includes practically all the eastern coastline of the island. The chief towns are Seibo, Higüey, Hato Mayor, and La Romana. The latter is small in population but important as the port of Seibo and Higüey and the country tributary to these towns. Macoris, the smallest of the three provinces, is on the south coast, and contains most of the sugar-estates in the Dominican republic. Its largest and only important town is San Pedro de Macoris.

Disregarding these political divisions, and speaking generally of the region visited, the northern half is hilly, while the southern part is practically level from Santo Domingo City to the east coast, a distance of about 100 miles. The mountainous region is nowhere higher than 1,800 feet, and the majority of the hills are much lower, so that the "Gran Cordillera" which includes the magnificent mountains of the Cibao and Haïti, here descends into a rather small mountain chain. There are a few isolated peaks off the main range, but they are essentially part of the great mountain chain which forms the backbone of eastern Cuba, Hispaniola and Porto Rico.

The region to the south of the main range, and continuing out to the south coast may be roughly divided into two general formations, — the wooded and the savannah formation. The former is found almost exclusively along a belt some twenty miles wide,

stretching along the south and east coasts, and it encroaches into the savannah at many points for some miles beyond its usual range. The savannah or "llanos" is a great plain covered with a tough wiry grass, with a considerable sprinkling of small patches of bush. All the country south of the before-mentioned range is slightly above sea level, the hills of two or three hundred feet that are often found being of no especial importance ecologically.

These three provinces of Samana, Seibo and Macoris contain scores of rivers, great and small. The most important one is the Yuna, a stream some 230 miles long, which flows from the Cibao to Samana Bay. This river and its affluents water a large hydrographic basin, but at its mouth it is not a large or deep stream. Of the rivers that take their rise in the mountain chain and flow north or south, the most important are the Casui and Macoris, Soco, and Chavon, all flowing south and all sluggish, except during the freshets. These three rivers and their branches, together with a number of smaller streams, are the chief water courses in the region south of the mountain chain. Commercially, one of them at least is more important than the thrice greater Yuna, but all of them have small hydrographic basins, and are not so important, ecologically, as the Yuna with its many affluents and great sphere of influence.

There is a great deal of variation in the amount, distribution and periodicity of the rains in Santo Domingo. Along the north coast from Puerto Plata eastward it rains heavily in October, November, December and January, except at and near Sanchez where it rains almost throughout the year. March and October are sometimes both dry months at Sanchez, but usually only March. These statements are based on information given by residents of Puerto Plata and Sanchez, and not on recorded observations. Along the south coast heavy rains may be expected in July, August, September and October, and sometimes also in June.* Scattered showers occur throughout the year.

* The weather and rainfall records of the south coast are based on figures kindly placed at my disposal by Mr. H. F. D. Burke, the Director-General of public works, Santo Domingo City; and also those taken at the "Porvenir" sugar-estate, San Pedro de Macoris, secured through the courtesy of Mr G. Ihssen.

From observations taken at San Pedro de Macoris, Santo Domingo City and Azua it is known that there is a decrease in the rainfall to the westward. The average yearly rainfall at the most easterly point is about sixty inches, at Azua it is 20.57 inches. This explains why the regions about Azua and Monte Cristi (a region climatically similarly situated) are the cactus gardens of Santo Domingo. It brings us also to the fact that the conditions are the same here as in the other West Indian Islands, as regards the rainfall in its relation to the wind and intervening mountains. During 227 days in the year the wind blows east, northeast or southeast. The great mountains situated to the windward of the regions about Azua and Monte Cristi collect the greater part of the moisture that comes in from the sea, leaving the leeward portions comparatively dry.

I append temperature records, in so far as they have been available. They are constructed from maximum and minimum readings, averaged.

TEMPERATURE RECORDS, FARENH.

1908.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
San Pedro de Macoris.	75.8	75.6	75.4	79.2	81.1	82.5	81.5	80.2	81.0	80.0	76.4	74.8
Santo Domingo City.											76.0	77.0

1909.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug	Sept.	Oct.	Nov.
San Pedro de Macoris.	73.3	73.8	77.9	77 9	80.3	82.2	82.5	82.8	82.8	81.1	74.4
Santo Domingo City.	75.5	75.2	76.5	80.0	76.2	79.7	81.1	80.0	78 6	80.3	76.4

The steamer arrived at Sanchez on October 21, and collecting was started in the afternoon of that day. A mountain at the back of the town was climbed and some ferns, orchids and bromeliads were secured. The hill is known as "Las Canitas" and is supposed to be 1,700 feet high, but can scarcely be more than 1,000 feet. Another ascent of this mountain was made at a different place, a cañon containing many interesting specimens being explored. A passion-flower vine with scarlet flowers formed a conspicuous feature in the vegetation, together with a number of plants of the arum family. More orchids and ferns were also found. It seems probable that the vegetation on "Las Canitas" is quite similar to what might be found on any one of the other mountains on the Samana peninsula.

To the west of Sanchez there is a large swamp which stretches for ten miles along the road to Arenoso. Two days were spent in this and many interesting specimens were secured, among them a giant *Polygonum*. The royal palm forms dense forests in this swamp, and in some cases it has almost exclusive control of large areas. Another beautiful plant collected here was a white-flowered water-lily that covered many of the small pools.

One day was spent in an ascent of the Yuna River. The strength of the current and our inability to get a power boat prevented our going up more than a few miles. Many interesting trees, some species of sedges, and a number of tall aquatic grasses were secured here. One can scarcely imagine the beauty and richness of the vegetation that may be seen from a boat while cruising on a tropical river. A light draught power boat would open up miles of such cruising along the Yuna and its branches.

The vegetation about Sanchez is rich in moisture-loving plants, but xerophytes seem to be wanting, excepting a few orchids and bromeliads. No cactuses were seen, and the residents say they are unknown in the region. The only palm seems to be the magnificent royal palm.

It had been the original intention to take the train from Sanchez up to La Vega, and make collections at that place and in the adjacent Cibao, but circumstances arose which made it undesirable. There is now an all-rail route between Moca and Puerto Plata, via Santiago; also trains from Sanchez to La Vega, San Francisco de Macoris and Salcedo. A short ride of two hours on horseback is all that is lacking of an all-rail route from Sanchez to Puerto Plata.

Owing to the impossibility of working over the Cibao region, and to the delay coincident with the uncertainty of the arrival of the next steamer, it was determined to go across the island to the province of Macoris. At midnight of October 28, a start was made from Sanchez in a small sloop. We crossed Samana bay diagonally to the mouth of the San Lorenzo River, leaving most of the baggage to be sent round to the south coast when the steamer should come. It rained every day during our stay at Sanchez.

Two days were spent at and near San Lorenzo, which is a

picturesque little harbor in Samana Bay. Interesting collections were made here and photographs taken of the wonderful caves which have fabulous stories related of their old-time buccaneer inhabitants. It was at San Lorenzo that the only tree-fern seen during the entire expedition was collected. Two other palms were found, neither of them having been met with on the north side of Samana Bay. One, known locally as "Manacla" is common here but it was not seen anywhere else. The other, a fan-leaf palm, was subsequently seen almost throughout the

FIG. 1. Building a dugout from the silk-cotton tree, San Lorenzo, Santo Domingo.

eastern end of the island. Still another plant of peculiar interest collected at San Lorenzo was a tiny *Dorstenia* found growing in the crevices of the limestone rocks. It is rare and was not seen again.

On Sunday afternoon, October 31, we left here for the Consuelo sugar-estate, in the province of Macoris, our destination on the south side of the island. Taking only as much baggage as one pack animal could carry, and with a man for guide we started on the ride of something more than sixty miles. The first ten miles

were through an abandoned banana-plantation and its environs, and brought us at length to the town of El Valle. This is a picturesque place, consisting of one grass-covered street and a row of native huts along each side. We were hospitably put up for the night by a Dominican. His native courtesy has been many times repeated; and it is a pleasure to report, that wherever I have travelled in Santo Domingo a similar feeling of good fellowship and friendliness has always greeted me.

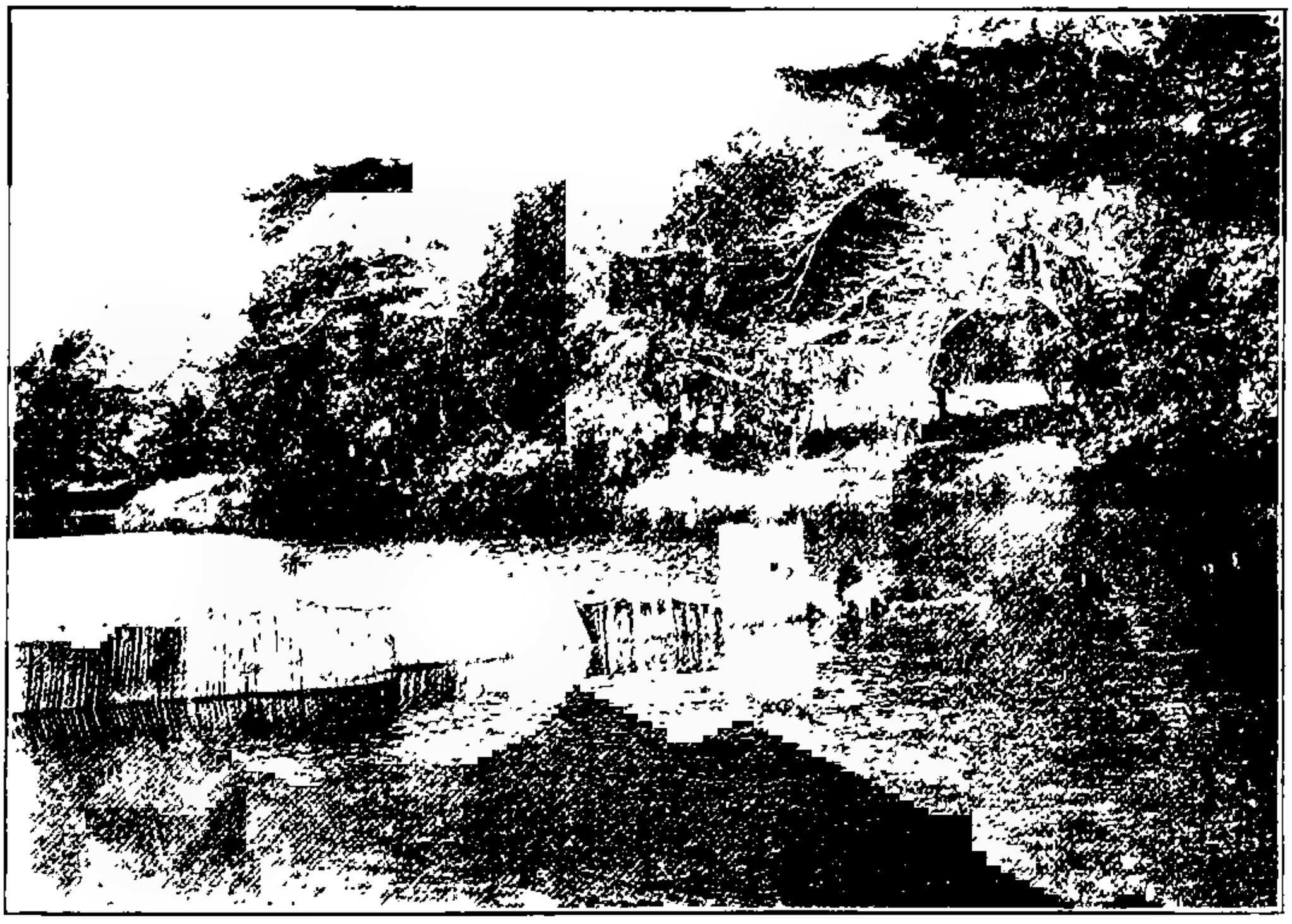

FIG. 2. Fish dam under construction. Made from slabs of the royal palm, Consuelo, Santo Domingo.

The next morning at daylight we left El Valle and rode for nearly seven hours through one of the most splendid primeval forests that could be imagined. Giant trees covered the hills and mountains; and the wealth of timber and the vines festooned through it shut out all traces of the sun. No collections could be made as we were travelling light and only a very few driers could be carried. A thorough investigation of this region would be very profitable to the botanist, as it certainly would be to the timberman.

The country up to this time had been hilly, but no great elevation had been reached until about noon, when we began the ascent of Buena Vista, which is the highest point between the north and south coasts of the island. On reaching the top a wonderful panorama stretched out in all directions. To the north lay all the vast tract of forest land through which we had come, and towards our destination at the south we could make out the beginning of the great level savannah country far below. Buena Vista is at approximately 1,500 feet. We pushed on that day to a little hamlet on the edge of the savannah called La Yerbabuena and here rested for the night. During all the ride from El Valle, which, by the way, was over inconceivably bad trails, we had passed three people and four houses. Otherwise the country is apparently uninhabited.

The following day at two in the morning we started under a bright moon and after a ride of some thirty miles reached Consuelo. The first five hours of this stage of the journey were spent in riding over the savannah, here and there our trail leading us through small patches of forest. After leaving La Pringamosa, a tiny collection of huts near the edge of the plain, we entered another long stretch of forest, through which we travelled for about two hours until we came to the cane-fields. On the score of plants collected the overland trip cannot be considered profitable. It was, however, exceedingly valuable as a means of getting a definite idea of the configuration of the country and of the typical plant formations that exist in the interior of Santo Domingo.

From November 3 to 29 all the collections were made, with some exceptions to be noted presently, within a short distance of Consuelo. This is a sugar-estate of 40,000 acres of which about 7,000 are under cultivation. Most of the remaining territory is wild country, if not, indeed, first growth forest. There are about fifty miles of connecting railway on the estate, and it is with much appreciation that I record the kindness of the administrative officials of Consuelo in putting this and their tug at my disposal. Without these ready means of transportation, and without their helpful coöperation, the expedition must have lost much valuable

time. The estate is about ten miles from the south coast, with which it is in communication by the Magua and Macoris rivers.

Collecting was started here as soon as possible, many orchids and bromeliads being taken as live plants for the conservatory collections. On November 7 a storm from the northeast put a stop to collecting and travel of any kind. The rain continued practically without interruption until November 13, and all the rivers became impassable. At Consuelo twelve inches of rain fell, in Puerto Plata twenty-nine inches, and the property loss through-

FIG. 3. *Sabal*, near Higüey, Santo Domingo.

out the republic was very great. Apart from the loss of time occasioned by the delay of my baggage, owing to the distress of the steamer, and the lost days in which collecting was impossible, the expedition suffered no direct damage from the storm. It had suffered indirectly, however, as many of the habitats for ferns, hepatics and other moisture-loving plants had been destroyed by the freshets.

On November 15 active collecting was resumed and a region known as "Monte Coca" explored. An exceptional opportunity

for the collection of trees was afforded at this point, as a new piece of the railroad was being built through the virgin forest. By following the gang of wood choppers, many interesting trees and epiphytes were collected, which otherwise it would have been difficult or impossible to secure. November 16 and 17 were spent in the same region. The flora impresses one as different from that seen at Samana, but not strikingly so. There is the same wealth of moisture-loving plants here varied by the occurrence of two species of creeping cacti. Besides the royal palm, the fan-leaf palm mentioned above was collected in fruit.

FIG. 4. Bayajibe, Santo Domingo.

Several days were then spent at different points on the estate, two trips on different branches of the river flowing through it were made. A fairly representative collection of the flora was secured, although no plants of sufficient interest to call for special mention were found. From observations made during my stay here it seems doubtful if ten per cent. of the flora was in flower or fruit at this season, and this was verified by residents of Consuelo who agree that the best time to collect flowering or fruiting specimens would be in April, May and June.

November 25 and 26 were spent near Azui, a small place in the province of Seibo, some ten miles from headquarters. Many interesting ferns and other plants were collected here, among them the only *Heliconia* seen during the trip. One day's collecting along the shores of the Magua, Iguama and Macoris rivers netted some interesting riparian species. Most of the country along these rivers is forest land and contains much of interest to the botanist.

The region within striking distance of Consuelo had by this time been pretty well covered, and a trip to the eastward was undertaken. Taking a sloop on the evening of November 30, I sailed to La Romana, in the province of Seibo. Collections were made here December 1–3, and an entirely new set of plants were found. Species of cactus and one sort of *Agave* were secured and live plants taken in each case. The growth here is woody but very few of the trees are more than twenty feet in height. The whole aspect of the country reminds one of a "scrub" growth and is in striking contrast to the richer vegetation seen at Consuelo and Samana.

On the morning of December 4 we left for the interior town of Higüey. It is about seven hours ride from La Romana, the road leading through the small town of Gato. Higüey is the last important town in the eastern part of the island, and is surrounded by a wild and interesting country. The town itself lies in the middle of a small natural savannah, but this grass land is not the predominating characteristic of the region. Native woods are found in abundance to the eastward of the town. Interesting collections were made near Higüey, a species of *Misanteca* being particularly noteworthy. Moscoso, a Dominican botanist, in his work * on the flora of the republic does not credit the tree to the country ; this fact added additional interest to the discovery. Another species of fan-leaf palm was also first seen here.

La Romana was reached again on December 7, one night having been spent on the road at Gato. The next day at three

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* Moscoso, R. M., Las familias vejetales representadas en la flora de Santo Domingo. 1–118 pp. Santo Domingo, 1897.

in the morning we left in a sloop for the town of Bayajibe. This is a small coast town on the western side of the peninsula which forms the extreme southeastern point of the island. We penetrated the interior for some miles at Bayajibe and a large collection resulted. The bush here is very dense and many species not previously seen were taken, among them live plants of a creeping cactus.

We then sailed to the island of Saona, a place reputed to be the depository of much ancient wealth. The character of the

FIG. 5. Salt lake on Saona Island, Santo Domingo.

vegetation here is much the same as that previously collected at Bayajibe, a notable exception being still another palm. This plant proved to be *Pseudophoenix Sargentii* and was found in considerable quantities. It resembles the royal palm but is much smaller. Some interesting saline plants were collected around the shores of the salt lake that is situated on Saona island. It was deemed inadvisable to sail farther round the east coast of Santo Domingo towards Cape Engano, local pilots vouching for the high winds at this season of the year. The cruise was ended

at Saona and we started for Romana. All this country could repay another visit during the early summer months of April, May and June. We returned to Consuelo on December 13.

During the trip to the eastern end of the region, our headquarters were established at La Romana, and it is to the kindness of Mr. H. van Kampen that this excursion was so successful. His knowledge of the country and hearty coöperation were invaluable.

It had been previously planned to go from Consuelo to Hato Mayor and explore the savannah country which lies all round this place, but unforeseen events made this trip impracticable and it was abandoned. Some more collecting about the estate and the packing and drying of the specimens consumed the time until December 19, when we sailed from San Pedro de Macoris to Santo Domingo City. Four days were spent in and around this historic city, which is the oldest permanent settlement in the New World. An attempt to trace an herbarium of Santo Domingo plants said to be in the city was unsuccessful, and no one interested in the flora of the island could be found. Leaving Santo Domingo City on December 23, we arrived in New York, January 2, 1910.

As a result of the expedition about 1,700 specimens for the herbarium, and seventy-five live plants for the conservatories have been secured. In addition much information about the country and its possibilities has been accumulated, which should serve as a basis for future explorations in Santo Domingo.

At your suggestion the common West Indian littoral and roadside plants have been for the most part ignored.

Respectfully submitted,

NORMAN TAYLOR,
Assistant Curator.

THE FOSSIL FLORA OF NEW YORK AND VICINITY.

In the course of a recent rearrangement of the fossil plant collections in the museum it was decided to make a special feature of those from New York City and vicinity, particularly from the Amboy clays and the Cliffwood clay marls of New Jersey, and

the ferruginous concretions of the Island Series of Staten Island, Long Island, Block Island and Martha's Vineyard, all of which deposits are Cretaceous in age and approximately equivalent to the Dakota group of the West.

About two thirds of floor case no. 6 and one quarter of floor case no. 7 is occupied by the New Jersey specimens and the remainder of case no. 7 by those from the islands to the eastward. Floor case no. 8 contains specimens of the Dakota group flora, with which comparisons may be made.

The flora of the Amboy clays, described by Professor J. S. Newberry,* had been known and the geologic age of the deposits in which the remains were found had been determined many years before any discoveries of importance had been made on the islands; although exposures of clay, sand and gravel, generally considered as probably identical with those of New Jersey, were more or less well known at a number of localities, notably in the vicinity of Kreischerville, Staten Island; Glen Cove, Long Island; Block Island; and in the celebrated cliffs at Gay Head, Martha's Vineyard. Paleontologic evidence, however, was lacking, and conservative geologists, in the absence of such evidence, declined to recognize the exposures as the equivalents of the New Jersey clays and clay marls.

In 1873, however, a geological map of the United States, prepared by C. H. Hitchcock and W. P. Blake, was issued in connection with the Ninth United States Census, on which the north shore of Long Island was indicated as Cretaceous. This feature was severely criticized by the eminent geologist J. D. Dana, in the American Journal of Science, who suggested that "a number of improvements . . . may be made in the map in preparing it for another issue. Some of these are . . . to take away the green color, which means Cretaceous, from the whole of the north shore of Long Island, no facts making the region Cretaceous." The discovery of fossil plant remains, however, and their identification, supplied the facts which determined the issue and subsequently ended all controversy.

A few specimens of fossil leaves were found in drift bowlders

* Monographs, U. S. Geol. Survey, vol. 26, 1895.

at Brooklyn and on Lloyd's Neck, which were recognized by Professor Newberry as very similar in aspect to those of the Cretaceous of New Jersey and the western part of the continent, and at a meeting of the New York Lyceum of Natural History, on March 23, 1874, he is quoted as saying that the rock in which the leaf impressions occur "is totally unlike anything known in this vicinity, and unfortunately has not yet been found in situ. . . . But its presence under these circumstances points to its existence in place at some locality not far away."

Subsequently similar specimens were found in the vicinity of Glen Cove on Long Island and at Tottenville on Staten Island, in close proximity to the clay exposures, and in 1885 well defined Cretaceous species were identified from the clay beds at Kreischerville, Staten Island.

It was during this period that Professor Newberry began his studies of the Amboy Clay flora, by means of which he was enabled to definitely correlate the New Jersey clays with the Dakota sandstone of the west and also to determine a number of the fossil leaves from Staten Island and Long Island as specifically identical with those from the Amboy clays and elsewhere, and thus to settle beyond further question the Cretaceous age of the clays on Staten Island and Long Island.

Immediately after this a systematic exploration of Long Island was begun by the writer, with the result that fossil plants were found at a number of different localities, extending all the way along the north shore from Brooklyn to Montauk Point. These explorations were subsequently extended to Block Island and Martha's Vineyard and a large amount of additional material was collected, all of which was described in "The Cretaceous Flora of Southern New York and New England"* as a companion volume to Professor Newberry's "Flora of the Amboy Clays."

The specimens now on display in the cases mentioned include all of those described by Professor Newberry and about two thirds of those described by the writer. The entire series is, therefore, especially rich in type and figured specimens; and those first discovered possess an historic interest in addition to

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Monographs, U. S. Geol. Survey, vol. 50, 1906.

their scientific value. As a local exhibit the collection is unique and it would take many years of field work to duplicate it, even approximately.

It may also be pertinent to remark that a large amount of material recently collected, which is most valuable from the biological standpoint, is not suitable for display purposes. Thin sections of lignites, cone scales, etc., represent this material, which is available for examination under the microscope. A preliminary illustrated description of certain of these specimens was issued in

FIG. 6. Middle Cretaceous flora after Saporta.

1909,* and a quantity of the crude material is now under investigation, which it is hoped may form the basis of another monograph or memoir on the subject.

The elements included in this flora indicate that at the period when it flourished a semi-tropical climate must have prevailed here. Eucalyptus, fig, magnolia, cinnamon, persimmon and other deciduous trees of southern distribution are prominently repre-

* "Studies of Cretaceous Coniferous Remains from Kreischerville, New York," Arthur Hollick and Edward Charles Jeffrey. Memoirs New York Botanical Garden, vol. 3, May 20, 1909.

sented, while the most abundant of the conifers are of the type of the Norfolk Island pine. Sago palms were also present. A species of *Nelumbo* grew in the waters and passion vines clambered up the trees. Associated with these were other genera of more northern distribution. Several species of sassafras, sycamore, willow, andromeda, etc., and the ancestors of the tulip tree, of which our *Liriodendron Tulipifera* is the sole living descendant, —foreshadowing a transition to the cooler climatic conditions of today.

ARTHUR HOLLICK.

NOTES, NEWS AND COMMENT.

Dr. J. K. Small, head curator of the museums and herbarium, and Mr. J. J. Carter of Pleasant Grove, Pennsylvania, left for Nassau, Bahamas, January 10. They expect to spend about four weeks in botanical exploration of the unknown interior of the Andros Islands and thus complete the botanical survey of the Bahamian archipelago.

Mr. Frank D. Kern, of Purdue University, has been granted a research scholarship in the Garden for one month to aid in his studies on the North American plant rusts, a group of small parasitic fungi, many species of which are injurious to cultivated plants.

Dr. P. A. Rydberg, curator, visited Baltimore and Washington early in January to examine specimens of the Caltrop Family which he is monographing for "North American Flora."

Prof. W. C. Coker, of the University of North Carolina, spent several days at the Garden carrying on further investigations in the flora of the Carolinas.

Mr. H. H. Bartlett, chemical biologist in the Bureau of Plant Industry, Washington, D. C., visited the Garden on January 3, examining the collections of *Dioscorea* in regard to the confusion which has existed concerning the drug known as "Wild Yam."

Dr. Mel T. Cook, of the Delaware Agricultural Experiment Station, Newark, Delaware, spent two weeks at the Garden dur-

ing January, looking up the literature concerning the occurrence of tannins, acids and alkaloids in plants, in connection with his studies on the factors concerned in the immunity of plants to specific diseases.

Among the "discoveries" of Mr. Norman Taylor, during his recent visit to Santo Domingo, was a work upon the flora of the island, apparently not known to any of the students of the West Indian flora. It is a book of 118 pages, entitled "Las familias vejetales reprensentadas en la flora de Santo Domingo," and published at Santo Domingo in 1897. The author is Rafael M. Moscoso, who refers repeatedly to a larger and still unpublished work from which the present one is merely an extract. Sr. Moscoso's brother, F. Eugenio Moscoso Puello, secured a copy of this book for Mr. Taylor, and this has been presented by him to the library of the Garden.

Prof. D. S. Martin has recently presented to the Garden an interesting parcel of old botanical drawings. Some are pencil sketches, by Dr. John Torrey, of the structure of the flowers and fruit of plants of New York State; there are also a number of colored sketches of fungi, probably the work of D'Jurco V. Knevels, whose signature or initials appear upon several of them. Dr. Knevels was a fellow-student with Dr. Torrey at the College of Physicians and Surgeons, and was one of the original members of the Lyceum of Natural History (now the New York Academy of Sciences).

The following letter has been received by the Director-in-Chief and the lantern-slides offered have been gratefully accepted, on behalf of the Board of Managers:

January 6, 1910.

Dear Sir:—

This Commission desires to present to each of a few of the leading educational institutions of the State a set of seventy-three stereopticon views relating to the discovery of the Hudson River and the inauguration of steam navigation thereon and will be happy to send you a set if you will kindly signify to us that it will be acceptable and useful in the work of your institution. The views are the same as were used in the public lectures de-

livered in New York City under the auspices of this Commission with the coöperation of the Board of Education on September 29, 1909, during the Hudson-Fulton Celebration. The "slides" are colored and are in a convenient, leather-covered, carrying case. A descriptive pamphlet accompanies them.

Yours very truly,
Henry W. Sackett,
Secretary,
Hudson-Fulton Celebration Commission.

Meteorology for December. — The total precipitation for the month was 4.51 inches, including a snowfall of 10 inches on the 25th–26th. Maximum temperatures were recorded of 58° on the 6th, 53.5° on the 14th, and 43.5° on the 24th. Also minimum temperatures were recorded of 23.5° on the 1st, 19.5° on the 19th, 16° on the 22d, and 6° on the 30th. The mean temperature for the month was 32°.

The rainfall recorded for August was 7.3 in. instead of 4.75 in. as previously published.

ACCESSIONS.

LIBRARY ACCESSIONS FROM NOVEMBER 1 TO DECEMBER 31, 1909.

APOLLINARIS, QUINTUS. *Kurtzes Hand-Büchlein und Experiment vieler Artzneyen.* . . . Strassburg, 1651.

BOLDINGH, I. *The flora of St. Eustatius, Saba and St. Martin.* Leyden, 1909.

BURGEFF, HANS. *Die Wurzelpilze der Orchideen ihre Kultur und ihr Leben in der Pflanze.* Jena, 1909.

CLEMENTS, FREDERIC EDWARD. *The genera of fungi.* Minneapolis, 1909. (Given by Dr. N. L. Britton.)

CORDES, J. W. H. *Het zamenstel der voornaamste Europesche houtsoorten.* Haarlem, 1857.

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HARPER, LEWIS. *Preliminary report on the geology and agriculture of the state of Mississippi.* Jackson, 1857. (Given by Dr. J. H. Barnhart.)

HASSKARL, JUSTUS KARL. *Aanteekeningen over het nut, door de Bewoners van Java.* . . Amsterdam, 1845.

HOEVEN, JAN VAN DER. *Commentatio de foliorum plantarum ortu, situ, fabrica et functione.* Lugduno Batavorum, 1820.

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PENHALLOW, DAVID PEARCE. *Report on tertiary plants of British Columbia collected by L. M. Lambe in 1906.* Ottawa, 1908. (Deposited by the Trustees of Columbia University.)

PRINCE, WILLIAM ROBERT. *The pomological manual.* Ed. 2. New York, 1832. (Given by Dr. J. H. Barnhart.)

SCHLEIDEN, MATTHIAS JAKOB. *De plant en haar leven.* Ed. 2. Leiden, 1872.

SCHWERIN, FRITZ GRAF VON. *Monographie der Gattung Sambucus.* Wendisch-Wilmersdorf, 1909. (Given by Dr. N. L. Britton.)

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VAN BASTELAER, DESIRÉ ALEXANDRE. *Promenades d'un botaniste dans un coin des Ardennes Belges.* Bruxelles, 1864.

VRIESE, WILLEM HENDRIK DE. *De medecijn-hof.* Leiden, 1852.

VRIESE, WILLEM HENDRIK DE. *Hortus Spaarn-Bergensis.* Amstelodami, 1839.

Webster's new international dictionary of the English language. Springfield, 1910. (Given by Dr. N. L. Britton.)

WIESNER, JULIUS. *Organographie und Systematik der Pflanzen.* Ed. 3. Wien, 1909.

MUSEUMS AND HERBARIUM.

1,200 specimens of flowering plants from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)

40 specimens of fleshy fungi from Chappaqua, New York. (Given by Mrs. C. E. Rider.)

3 specimens of *Colvillea racemosa* from Jamaica, West Indies. (Given by Mr. William Harris.)

270 specimens, being the botanical collections of the Peary Arctic Club Expedition of 1908–09. (Given by the American Museum of Natural History.)

4 specimens of mosses from North America. (By exchange with Professor T. C. Frye.)

3 specimens of mosses from New Haven, Connecticut. (By exchange with Mr. Geo. E. Nichols.)

35 specimens of flowering plants from the eastern United States. (Given by Mr. S. S. Van Pelt and Mr. C. S. Williamson.)

6 specimens of coniferous plants from New Jersey. (Given by Mr. Bayard Long.)

1 specimen of *Artemisia biennis* from England. (Given by Mr. G. Claridge Druce.)

100 specimens, "Fungi Columbiani" Century 30. (Distributed by Mr. Elam Bartholomew.)

3 specimens of mosses and hepatics from British Columbia. (Given by Dr. H. H. Rusby.)

1 specimen of *Puccinia poromera*. (Given by Mr. E. W. D. Holway.)

25 specimens, "Lichenes Suecici Exsiccati" fascicle VI. (Distributed by Dr. G. O. A. Malme.)

33 specimens of flowering plants from North America. (By exchange with the United States National Museum.)

3 specimens of mosses from Bronx Park, New York City. (Given by Mrs. N. L. Britton.)

67 specimens food plants from western North America. (Collected by Dr. H. H. Rusby.)

12 specimens of fossil plants from Shiobara, Japan. (Given by Miss M. C. Stopes.)

20 specimens of fossil plants from Eschscholtz Bay, Alaska. (Given by Professor H. F. Osborn.)

103 specimens of fossil plants from Florissant, Colorado. (Given by Mr. Frederick K. Vreeland.)

135 specimens of fossil plants from Colorado. (Given by Professor J. F. Kemp.)

344 specimens of fossil plants from Colorado. (Deposited by Columbia University.)

1,437 specimens from Cuba. (Collected by Dr. J. A. Shafer.)

16 specimens of drugs for the Economic Museum. (Given by Dr. H. H. Rusby.)

4 specimens of mosses from South America and Africa. (By exchange with Dr. F. V. Brotherus.)

5 specimens of mosses from tropical America. (By exchange with Mr. Jules Cardot.)

20 specimens of flowering plants from the Black Hills, South Dakota. (Given by Mr. N. T. Peterson.)

118 specimens of flowering plants from Canada. (By exchange with the Geological Survey of Canada.)

9 specimens of *Lepidium* from the eastern United States. (Given by Mr. E. P. Bicknell.)

PLANTS AND SEEDS.

7 orchids for conservatories. (By exchange with Mrs. Ernest Meière.)

22 plants from Cuba, for conservatories. (Collected by Dr. J. A. Shafer.)

2 plants of *Lilium superbum* from Staten Island, for herbaceous grounds. (Collected by Mr. John Finley.)

14 plants for conservatories. (By exchange with U. S. National Museum through Dr. J. N. Rose.)

40 plants from Santo Domingo, W. I., for conservatories. (Collected by Mr. Norman Taylor.)

8 specimens of duckweeds and *Azolla* from Holland, for conservatories. (Given by Prof. J. B. Smith.)

2 packets of seed for nurseries. (By exchange with Mr. John Dunbar.)

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Vol. 22, part 2, issued December 18, 1905. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Hamamelidaceae, Pterostemonaceae, Altingiaceae, Phyllonomaceae.

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Vol. 22, part 3, issued June 12, 1908. Grossulariaceae, Platanaceae, Crossosomataceae, Connaraceae, Calycanthaceae, Rosaceae (pars).

Vol. 22, part 4, issued Nov. 20, 1908. Rosaceae (pars).

Vol. 17, part 1, issued June 30, 1909. Typhales—Poales.

Vol. 16, part 1, issued Nov. 6, 1909 Ophioglossales—Filicales.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by Dr. Arthur Hollick and Dr. Edward Charles Jeffrey. viii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 pp., with 73 figures and 14 plates. 1908.

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. Five volumes.

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EDITOR

PERCY WILSON

Administrative Assistant

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RELATIONS OF BOTANICAL GARDENS TO THE PUBLIC.*

Botanical gardens are important factors in public education, and are, at the same time, places for public recreation and enjoyment. They are highly specialized parks in which the plantations are formed and arranged primarily with regard to botanical facts and theories. Inasmuch as the great majority of their visitors have little time to spend, the information they carry away is more generally by impressions than by closer observation, although individual plants and groups of plants will often be remembered by casual visitors for long periods of time. Botanical gardens are therefore in effect museums of living plants, and the plants, treated as museum objects, suitably labeled, are installed to illustrate not only the objects themselves, but their relation to other objects. This museum feature is then a direct and immediate function in imparting information to the public.

The grouping of plants in botanical gardens is susceptible of widely different treatments, depending upon the character and the area of land available, the expense involved, and the facts and theories selected for illustration; also in the temperate zones, at least, upon the amount of greenhouse space available; also on the relative importance given to landscape considerations and upon the areas retained as natural forest, thicket or meadow. Facts and theories capable of demonstration may be grouped in

*Read in a symposium on botanical gardens at meeting of American Association for the Advancement of Science, Boston, Dec. 28, 1909.

a general way as (1) Biological Relationships, (2) Morphological and Physiological Features, (3) Economic Applications, (4) Geographical Distribution, (5) Aesthetic and Landscape Features. Practical considerations enter largely into groupings of any kind.

1. *Biological Relationships.* — In this installation it is sought to illustrate species of the various plant families in juxtaposition, the groups thus formed being located in relation to each other in some predetermined sequence ; this sequence in recently planted botanical gardens is usually one which seeks to demonstrate not alone affinity, but the progressive increase in floral complexity, in other words, an evolutionary sequence. In such installations practical considerations render the sequence necessarily incomplete in any one set of plantations ; sunshine-requiring herbaceous plants and shrubs cannot be successfully grown close to trees, and some natural families, such as Papilionaceae and Rubiaceae contain herbs, shrubs and trees ; climatic considerations prevent many families being brought into any one sequence ; the biological grouping must then be obtained piecemeal ; the most satisfactory and least expensive method is to grow the collections of trees (arboretum), of shrubs (fruticetum), of vines (viticetum), and of herbaceous plants, for the most part, at least, in separate areas ; families principally composed of plants inhabiting climates other than that of the locality require artificial environment, such as glass houses for tropical and warm-temperate zone plants in gardens of the cold-temperate zone ; it would be an interesting experiment to ascertain if arctic plants could be grown successfully in the temperate zones by some system of refrigeration. By a suitable arrangement of land and water, aquatic plants may be brought to some extent into juxtaposition with those of the same or related families requiring dry soil. One advantage in the biological grouping of large collections is the facility with which any species represented may be found when wanted. By the formation of a museum of prepared plants, of fruits, seeds and other organs, of photographs and drawings, the biological sequence adopted may be quite completely illustrated.

By indicating on the labels the native regions of plants biologically grouped, much simple information bearing on geographical

distribution may be given. Casual observers are often as much interested to learn where a plant came from as to learn if it has any useful or ornamental features; the biological grouping also teaches them, by suggestion, that plants even from remote regions are related to other plants which they may know something about and thus opens up new lines of thought for many people.

2. *Morphological and Physiological Features.* — The demonstration and illustration of structure and function presupposes some acquaintance with elementary botany, which the great majority of visitors do not at present have. The rapid development of nature-study in schools will render groupings of plants arranged from these standpoints much more generally significant than they are at present. It is possible and practicable to form groups of plants selected to illustrate the gross morphology and the simpler phenomena of physiology. These groups are more likely to be elaborated in gardens established primarily for students than in those laid out primarily for the use of the public. To a certain extent, groupings illustrating ecological considerations can also be established with advantage, although areas remaining in the natural state are more useful.

3. *Economic Applications.* — Plants grouped and labeled with reference to their uses, or the uses of their products, are of very direct interest to the public, coming, perhaps, closer to ordinary lines of thought than any other features of the vegetable world, except those of beauty. The arboretum illustrates the subject of forest products without the necessity for a separate grouping of trees. Economic features of shrubs and herbaceous plants are best brought out by a special installation classified as food plants, drug plants, fiber plants and otherwise. As in the case of systematic grouping, economic installation has to be piecemeal, using glass houses for tropical economic plants and for those from warm-temperate regions. The elaboration of labels is of great importance and is, perhaps, the most expensive feature in the satisfactory display of useful plants. These subjects can be very thoroughly illustrated by the formation of musems of economic plant products and this is usually accomplished in highly developed botanical gardens. A system of cross references on labels be-

tween the living collections and the museum collections is a great desideratum. The expense of such a system is, however, very great, and it requires constant attention, because the death of a living plant, which cannot at once be replaced, complicates it.

4. *Geographical Distribution.* — Groups of plants illustrating the botanical features of regions other than those of the locality of a botanical garden may be installed, and this feature is given more or less prominence in the collections of many gardens. As mentioned under biological relationships, the information thus furnished is of immediate interest to the public, and in some gardens geographical grouping has been adopted as a primary classification. Like the biological grouping, it has its limitations, and conditions of soil and climate make it necessarily imperfect and incomplete. Any attempt at growing trees, shrubs and herbaceous plants of a region close together in limited areas, while at first very interesting, ultimately fails because of the growth of the trees and the consequent shading out of the lower plants, unless the trees are cut out and their value in the grouping lost. Climatic conditions may be overcome by temporary geographical groupings, and in greenhouses some such groups may be installed quite satisfactorily. As to the relative value of the biological over the geographical as a primary classification in large public gardens, there is room for difference of opinon. An ideal method, if space and funds are available, would be to install both systems.

5. *Aesthetic and Landscape Features.* — The public is more immediately interested in landscape effects and in plants from the standpoint of beauty than in most other features of botanical gardens. Well-built and well-kept grounds appeal to people as attractive places to visit. Natural woodlands, thickets and meadows also interest visitors, perhaps more keenly the residents of cities, and, in some respects, especially from the standpoint of ecology, are as useful educationally as the artificial plantations. Landscape considerations applicable to parks and private grounds are not wholly adaptable to botanical gardens, and this is often notably true in the inharmonious floral color contrasts necessitated by the grouping, although these may be minimized by careful selections. In most botanical garden planting it is sought to

display the plant in its natural form, so that extensive massing of individuals is avoided, although, in large gardens space is often available for both massed and open planting. In the grouped plantations incongruous elements should be avoided, such as establishing herbaceous flowering plants in plots among collections of trees and shrubs, which would divert attention from the main installation, or the introducing of exotic species into natural woodlands and thickets, which would give the public erratic ecological conceptions. Flower gardens, as such, are generally located separately from the botanically grouped plantations, for in them aesthetic considerations are predominant.

The popularity of botanical gardens causes them at times to be overcrowded and problems relative to the control and circulation of large numbers of people arise which have to be met as well as possible. A comprehensive system of paths is essential ; the majority of visitors instinctively keep to the paths, but it is undesirable in large gardens, at least, to actually restrict visitors to paths, for they could then come close to only a relatively small number of the plants installed, unless the path system was unduly elaborated and landscape considerations wholly neglected. A very small proportion of the public is intuitively destructive, and it is this small number of people that entail high expense for guards and keepers ; legal punishment of offenders as a warning to others of mischievous proclivities is the only treatment available. In large gardens a driveway system and provision for conveyances for hire are also desirable, for many visitors are unable or unwilling to walk considerable distances.

The indirect relation of botanical gardens to the public lies in their function of adding to the knowledge of plants and plant products and the diffusion of this knowledge by publication and otherwise. Laboratories, herbaria and a library are essential adjuncts to the garden itself, and through investigations carried on in them and in the garden, additions to knowledge are constantly made. Of these additions to botanical information those of an economic character are the most immediately available for the public good, but the more theoretical additions to information may prove the more important in the long run.

From what I have said it will be clear that the function of botanical gardens in their relation to the public is somewhat different from their relations to college and university students, although, after all, this difference is one of degree rather than of kind.

N. L. BRITTON.

REPORT ON A BOTANICAL VISIT TO THE ISTHMUS OF PANAMA.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Dear Sir: In anticipation of fulfilling a long-cherished desire to investigate the marine flora of the Panama region, I was enabled, with your permission and with the aid of the exploration fund of the Garden, to leave New York for Colon on November 27, 1909, by the steamer *Tagus* of the "Royal Mail" line. I was accompanied by Mrs. Howe, who rendered efficient assistance in the preparation of the specimens secured. Our first stop was at Kingston, Jamaica, where we took advantage of a day's wait-over to visit the Hope Gardens and to call upon Hon. H. H. Cousins, Director of Agriculture for Jamaica, and Mr. William Harris, Superintendent of Public Gardens and Plantations.

Colon was reached on the morning of Sunday, December 5, and we immediately crossed the Isthmus — a distance of about 48 miles — on the Panama Railroad to the city of Panama. This town is attractively situated on the placid island-studded bay of the same name and to the landward is flanked by near-by hills and distant mountain ranges. The next day we called on Col. W. C. Gorgas, Chief Sanitary Officer of the Isthmian Canal Commission, and were granted permission to stay for a time at the Taboga Sanitarium for convalescents, maintained by the Commission on Taboga Island, which is in the Bay of Panama, twelve miles from the city. The following morning we went out to this island on the government launch and were most hospitably received by the superintendent of the sanitarium, Dr. W. E. McPherson, who arranged for us a commodious laboratory and did everything in his power to facilitate our work. The sanitarium is located near the rocky shore and, altogether, our surroundings

seemed ideal for successful work with the marine flora — except for the one unhappy fact, which gradually became apparent, that a marine flora, in the ordinary sense, was in that region almost non-existent. The vertical rise and fall of the tide on this and the adjacent islands appeared to be, while we were there, from twelve to fifteen feet, but at the ebb of the tide, the pools, and the rocks and stones, both above and below the low-water line, were seen to be nearly destitute of plant life — at least, of conspicuous species. And not a fragment of an alga or of any marine seed-plant was found washed ashore at any point in the part of the Bay of Panama that was examined. There were a few closely incrusting species of *Ralfsia*, *Hildenbrandtia*, Squamariaceae, Corallinaceae, and Cyanophyceae, and certain minute filamentous and unicellular forms representing various groups of algae. The material secured has not been critically studied as yet, but it would probably not be far out of the way to say that no more than fifty species of marine algae were seen and collected during the week that was spent in exploring the shores of Taboga Island and of the adjacent islands, Urava and Taboguilla. The cause of the paucity of marine plant life in this region is not wholly obvious. The scorching effect of the direct rays of the tropical sun is of course unfavorable to any luxuriant development of the algae between the tide-lines, as is abundantly demonstrated in the West Indies, yet, *a priori*, one might reasonably expect to find here a considerable growth of plants near the low-water line, as in corresponding latitudes in the West Indies and as, indeed, only fifty miles or less to the northward on the Caribbean shores, even though it be on the shores of another ocean and on the opposite edge of a continent. The only obvious factor in which the conditions are manifestly different on the opposite shores of the Isthmus is found in the range of the tides. In the Bay of Panama the tides have a maximum vertical range of from ten to nineteen feet; at Colon, on the Atlantic or Caribbean side, the range is commonly less than two feet. On the borders of the Caribbean Sea there is often an abundance of algae in water that is much deeper than that which at flood tide covers the rocks at low-water line in the Bay of Panama, but it is clear that

they are not subject to any such fluctuations in water-pressure and light-intensity as would be the case under the heavy tides of the Pacific side of the Isthmus, for in the whole West Indian region the range of the tides is for the most part only two or three feet. Observations as to the relation of the amplitude of the tides to the development of the marine flora in the tropics are apparently few and any sweeping generalizations are doubt-

FIG. 7. Low tide, Bay of Panama.

less unwarranted, yet it seems probable that the combination of wide-ranging tides and a tropical insolation is distinctly unfavorable to any luxuriant growth of marine vegetation. It should be added that spermatophytes also, of such genera as *Thalassia*, *Cymodocea*, *Halodule*, and *Halophila*, some of which, as to individual plants, are profusely abundant in most parts of the West Indies, especially on a muddy or sandy bottom in moderately

quiet water, seem to be entirely lacking in the Bay of Panama. Animal life, too, in the littoral zone, at least, is poorly represented, as compared with the Caribbean region. However, one or two kinds of coral were occasionally conspicuous just below the low-water mark. In connection with the question of the influence of the tides in the development of a tropical marine flora, it is of interest to note that a Swedish botanist, Dr. Nils Svedelius, has recently reported that at Galle, on the south shore of Ceylon, where there is a rich development of littoral and sublittoral life, both animal and vegetable, and where a marine biological station has been established, the range of the tide is only about three feet. Whether the deeper waters in the Bay of Panama would yield any considerable number of algae, I am unable to state, so far as results of any attempt at dredging are concerned. I went to Taboga Island equipped with a biological dredge, but the general dearth of visible algae and the rough character of the sea-bottom, combined with rather unsatisfactory experiences with dredging operations under apparently more favorable conditions, deterred me from unpacking the dredge — a circumstance that I now regret.

The harvest of algae being scanty at Taboga Island, I here, as also later during the expedition, gave some attention to securing photographs of botanical interest and to collecting mosses, Hepaticae, fungi, lichens, fresh-water algae, and occasional seed-plants. The annual rainfall on the Pacific side of the Isthmus is much less than that on the Caribbean side. The average yearly rainfall at the city of Panama is given as about 72 inches, while at Colon it is about 128 inches. On Taboga Island, judging from common report and the character of the vegetation, the yearly rainfall is less than at the city of Panama. While we were there — the second week in December — there were frequent showers and the vegetation in general had an intensely green and luxuriant aspect. The higher plants were less frequently found in flower or fruit than would doubtless have been the case a little later, in the drier months of January, February, and March. But the rains were favorable, on the whole, for the growth, and also for the detection, of the fungi, mosses, and lichens. Taboga

Island has a circumference of about three miles and rises to a height of perhaps one thousand feet. A considerable part of the land is under cultivation, the growing of pineapples of a particularly delicious quality being the principal industry. The southern side of the island, however, is precipitous and is partly covered with a native forest. In densely shaded places in the upper ranges of this forest two handsome species of *Begonia* were found in flower and dried specimens of them, with seeds, were obtained.

FIG. 8. *Clusia rosea* on a rock-islet near Taboguilla Island, Bay of Panama; a *Cereus* just above the high-water mark. Photograph taken at a half tide. This and the neighboring islets are much frequented by sea-birds.

The rainfall in this region is too great for any extensive development of a cactus flora, but on the rocky borders of the islands of Taboguilla and Urava, two species of *Cereus* (in the older sense) and one of *Opuntia* were found. They were without flowers or fruit, so far as observed, but plants of a small narrow-leaved

Agave or "century-plant" growing near them were sending up flowering-stalks to a height of from four to ten feet. These stalks sometimes bore bulbils in the place of flowers and sometimes both flowers and bulbils in a single inflorescence. Living specimens of the *Agave*, the three cacti, and of two orchids were crated and forwarded to the Garden, where they are now growing in the propagating houses, in spite of the fact that they

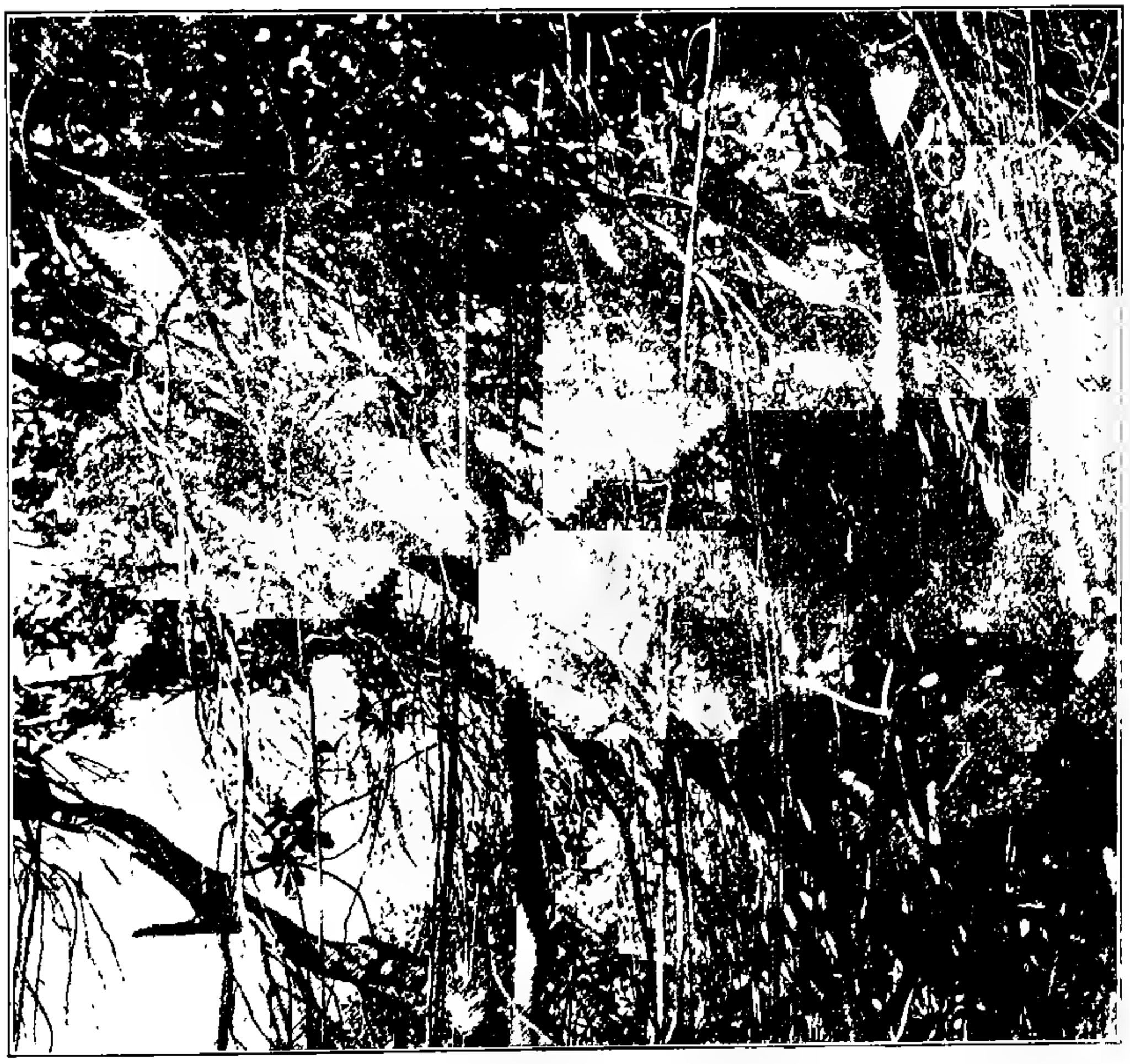

FIG. 9. Aerial roots of *Clusia rosea* on a rock-islet near Taboguilla Island, Bay of Panama. The waters of the Bay are shown at the lower left-hand corner.

reached New York during the severe winter weather of the recent Christmas holidays.

Near the island of Taboguilla are several more or less dome-shaped rock-islets rising abruptly from thirty to eighty feet above the high-water mark and crowned with a densely interlaced tangle

of *Clusia rosea*, one of the group of peculiar trees that in the British West Indies are known as "Scotch attorneys" from their habit of starting their growth on another tree and finally strangling and replacing the host tree by their numerous clasping and twining aerial roots. Here, however, the *Clusia* has evidently started on a naked rock, the crevices of which have been penetrated by the creeping roots. As the stem has raised itself in the

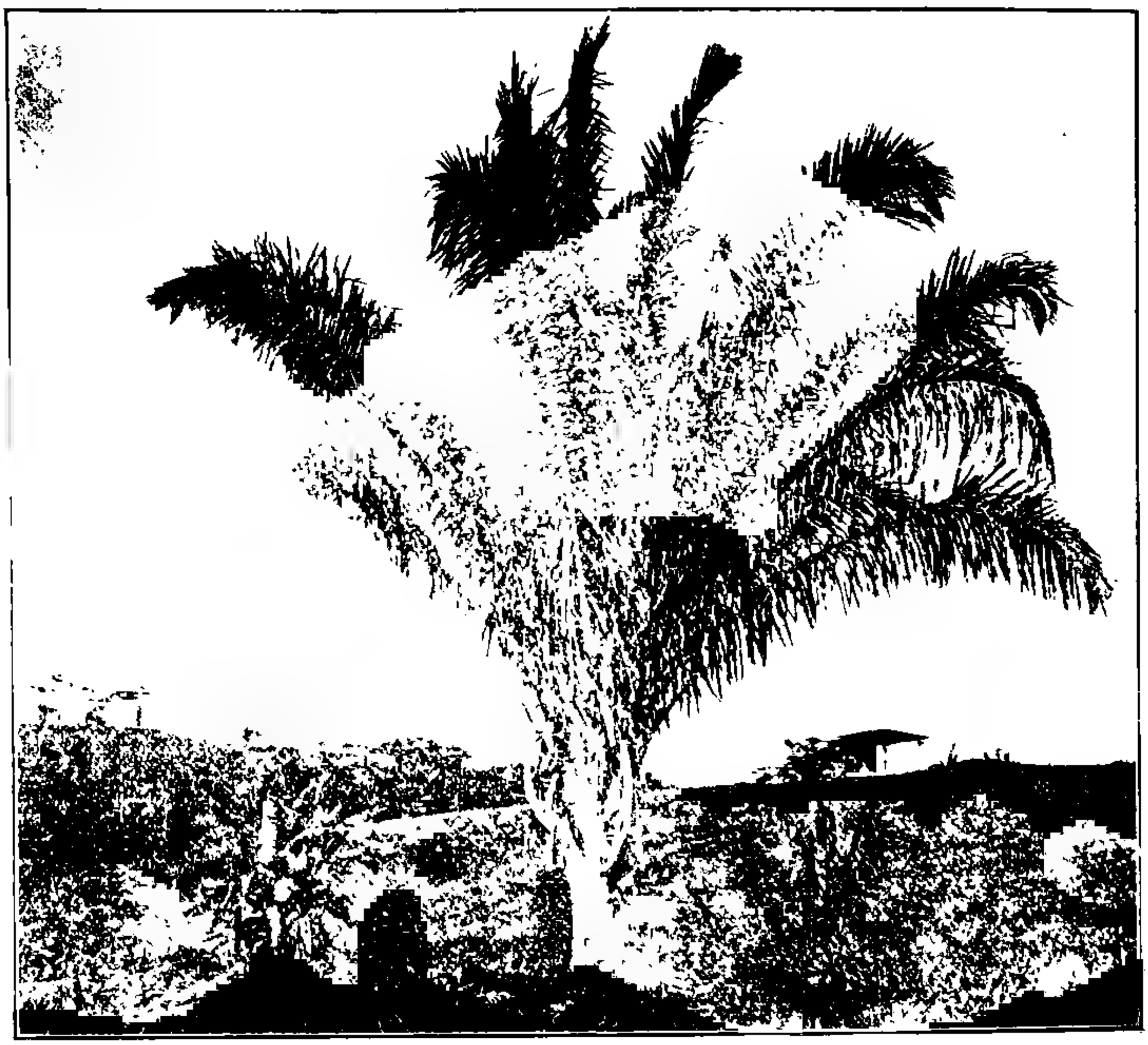

FIG. 10. *Attalea*, at Culebra, Canal Zone, showing a large pendent cluster of fruit.

air, aerial roots (FIG. 9) have been sent down from its branches and grasping the rock or some part of another tree of the same sort, have added their support and anchorage to the growing tree as it spreads and sprawls over the barren rocks. In this way a dense tangle of branches, roots, and trunks is formed, covering sometimes several square rods — a tangle in which individual trees, if they exist, can scarcely be distinguished. In habit of growth

the *Clusia* is here quite suggestive of the widely different banyan of the East Indies. It illustrates well what a luxuriant develop-

FIG. 11. *Attalea*, at Culebra, Canal Zone. Detail of the cluster of fruit shown in Figure 10.

ment certain trees in the tropics can attain on a practically naked rock with no soil except that formed by their own fallen leaves

and by the droppings of the sea-birds that make their homes in its branches. Some of the smaller islets have scarcely anything but the *Clusia* in their seed-plant flora, and, crowned with the dense polished dark-green foliage of this peculiar tree, they present a most curious and interesting appearance, especially when at ebb-tide the green crown seems to be lifted out of the water by a pedestal fifteen or twenty feet high of almost perpendicular bare rock. The islet shown in the photograph (FIG. 8) is one of the larger of its sort and while the *Clusia* is, I believe, the only tree or shrub represented there, several of the higher plants have gained a foothold about the base, notably a pendulous, creeping, and climbing *Cereus*, which is shown, rather indistinctly, towards the right of the picture.

We left Taboga Island on December 14 and returned to the city of Panama, or rather to Ancon, its Canal Zone suburb, where we remained for another week. The city, or most of it, is situated on a point of land, which is succeeded to the seaward by an extensive area of shallow water, so that at a good low tide (FIG. 7) one can walk out almost half a mile from the massive old Spanish seawall, against which the waves break at high tide. The bottom is largely rock and there are numerous tide-pools and tidal runways, which a collector of algae might be pardoned for hoping to find teeming with the tropical treasures of his speciality, but such, unhappily, are conspicuous mostly by their absence. In occasional places the exposed littoral rocks in the lowest third or fourth show a good growth of *Caloglossa*, *Bostrychia*, and *Gelidium* (?), and a little lower are a *Ralfsia* and three or four species of encrusting Corallinaceae and Squamariaceae. These, with a few blue-green algae, a few other more or less microscopic forms, and a *Chaetomorpha* in the higher lit-
to al regions, appear to constitute, roughly speaking, the marine flora of the immediate surroundings of the city of Panama. Through the courtesy of Mr. George W. Miller, the manager of the Panama office of the Central and South American Telegraph Company, a small house on the water-front was placed at my service as a laboratory, but the poverty of the collecting field so far as the algae were concerned rendered it scarcely a necessity.

Algae of more interest, however, were found growing on roots of mangroves in the swamps bordering the Pacific terminus of the Canal at Balboa, formerly known as La Boca. Here, also, were secured specimens and photographs of a peculiar, interesting, and at present undetermined tree that was growing in the "mangrove formation" in association with *Rhizophora*, *Avicennia*, *Laguncularia*, *Conocarpus*, etc. For access to a photographic

FIG. 12. A spiny-trunked native palm (*Astrocaryum* ?), at Culebra, Canal Zone.

dark-room in Ancon, I am indebted to the kindness of Dr. Samuel T. Darling, Director of the Pathological Laboratory of the Ancon Hospital. While making our headquarters at Ancon, we spent a day at Culebra, where the deepest cut of the Canal is being made. Here we collected mosses, etc., photographed native palms, and also made a call upon Col. George W. Goethals,

chairman of the Isthmian Canal Commission, to whom we are indebted for various helpful courtesies.

On December 21 we crossed the Isthmus and located at Colon, the northern terminus of the Panama Railroad. This town, though politically distinct, is essentially continuous with the American settlement Cristobal, which is at the Atlantic end

FIG. 13. A large silk-cotton tree (*Ceiba pentandra*) with epiphytes, at Ahorca Lagarto, Canal Zone.

of the Panama Canal. Colon and Cristobal are situated on what was originally Manzanillo Island, which was largely a mangrove swamp, fringed to the seaward by a coral reef. A fill along the line of the railway has converted the former island into a peninsula. The coral reef along the northern margin of this island or peninsula is exposed to almost the full force of the surge of the

Caribbean Sea, being only slightly protected by Point Toro, which lies about three miles to the northwest. The range of the tide here is only about two feet under ordinary conditions and the reef has a fairly well-developed algal flora, in striking contrast to that of the Bay of Panama, with its heavy tides, less than fifty miles to the southward. The species are mostly, at least, those of a wide distribution among the West Indian islands and on the borders of the Caribbean Sea. On this exposed reef they are naturally of the surf-loving kinds, among which the unsegmented corallines are well represented. Among the plants of peculiar interest found growing on this reef were two or three specimens of what I take to be *Meristotheca Duchassaingii*, which was originally described from the island of Guadeloupe and has since been found washed ashore in Barbados and in southern Florida. A few species, not otherwise seen, were obtained by dredging in the quieter waters of Manzanillo Bay to the eastward of the island on which Colon is located. Towards the end of our stay in Colon a successful afternoon of dredging was enjoyed near Point Toro, with the kind assistance of Dr. C. A. Hearne, Assistant Quarantine Officer, and the aid of an electric launch belonging to the quarantine station.

During the first ten days of our stay in Colon, our work was somewhat hampered by heavy rains. We happened to be there during the worst of the three floods that visited the Canal Zone during the past season and Panamanian floods are of a sort that interfere more or less with nearly every form of human activity. At the meteorological station at Cristobal a rainfall of over 34 inches was recorded for the month of December — the highest record for December in the thirty-nine years during which records have been kept in Colon and vicinity. The record for November was 42.5 inches, which had been exceeded only once during the same period. The soil and humus deposits were, naturally, well and continuously saturated with water during our visit, and this condition, together with the prevalent high temperatures, was very favorable to the development of fungi, of which a considerable number of species were secured for the Garden collections. I walked the tracks of the Panama Railroad from Colon

to Ahorca Lagarto, a distance of 12.7 miles, taking photographs of trees, plant associations, etc., which will be of service in the lecture courses given in the Garden. On such trips I was able to secure, also, specimens of mosses, Hepaticae, fungi, fresh-water algae, etc. One plant that was found growing in abundance in the marshes between Mt. Hope and Mindi may prove of some sanitary interest and importance to the inhabitants of the Canal Zone. This was an *Azolla*, a closely related species of which

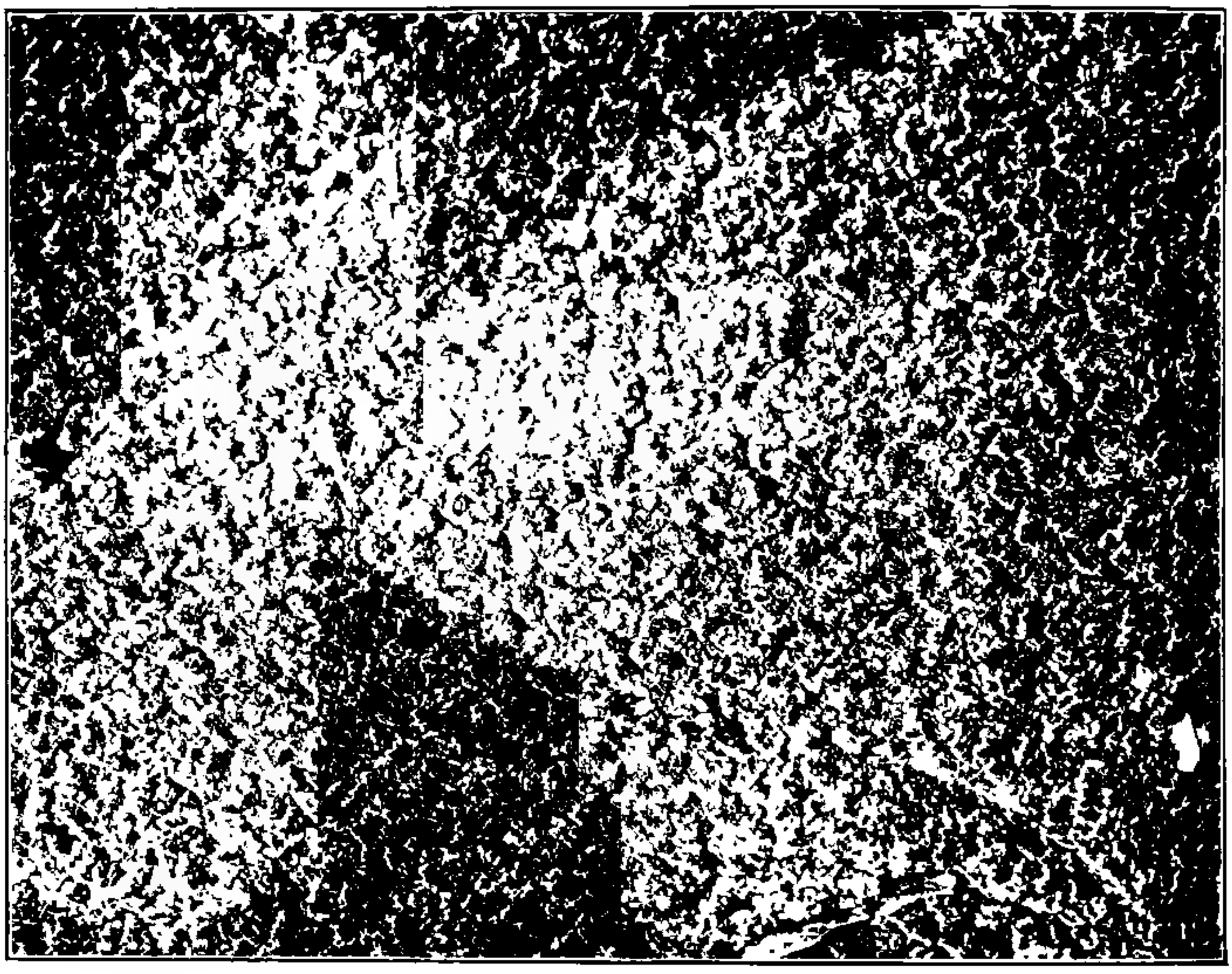

FIG. 14. *Azolla* on surface of water in a swamp between Mt. Hope and Mindi, Canal Zone.

has been successfully used by European sanitary officials in the warfare against mosquitos and malaria. It is a small plant of moss-like habit, though allied to the ferns rather than to the mosses. Certain species of this genus, when growing under favorable conditions, as was evidently the case in these Panamanian marshes (FIG. 14) form floating masses so dense, that, it is said, they prevent mosquito-larvae, developing in the water below, from obtaining sufficient air, thus asphyxiating them or

even preventing the hatching of the eggs, operating, in short, very much as does the mosquito oil, which is now used so copiously and effectively in the Canal Zone. I communicated this find to Col. W. C. Gorgas, Chief Sanitary Officer of the Isthmian Canal Commission, who manifested much interest in the matter. All the specimens of this *Azolla* that were collected were sterile and the determination of the species cannot be made with entire confidence. It is, however, larger and of a denser

FIG. 15. A flood on the Chagres River, near Gatun, January 1, 1910.

habit of growth than the *Azolla caroliniana* of the United States and southward and is probably *Azolla filiculoides*, originally described from southern South America but now considered to range as far north as California.

For various courtesies which facilitated our work in Colon and vicinity and added to the comfort of our stay there, we are especially indebted to Col. George W. Goethals, Chairman of the Isthmian Canal Commission, to Judge Thomas E. Brown, Jr., of

the Canal Zone Judiciary, and to Mr. Pierce T. Murphy, Superintendent of Hotels and Quarters of the Panama Railroad.

We left Colon on January 12 on the S. S. *Clyde* of the Royal Mail Steam Packet Company and reached New York on January 19, making a brief stop at Kingston, Jamaica, *en route*.

Respectfully submitted,

MARSHALL A. HOWE,

Curator.

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CONFERENCE NOTES.

The regular monthly conference of the scientific staff and students of the New York Botanical Garden met in the library on January 5. The first paper of the afternoon consisted of a discussion of the variations among the non-lobed Sassafras leaves by Mr. E. W. Humphreys.

The results presented were based upon the study of five hundred simple Sassafras leaves collected at random in Pelham Bay Park, Bronx Park, and along the Palisades of New Jersey.

The characters studied were the ratio of breadth to length, the leaf form, the condition of the tip and of the base, and the venation. The ratio of length to breadth was found to vary from 1–1¼ to 1–3¾. In form, the leaves were oval, elliptical, oblong, oblanceolate, obovate, lanceolate, and ovate. Of these, the oval leaves were by far the most numerous, amounting to nearly 61 per cent. Emarginate, truncate, obtuse, acute, acuminate, and cuspidate tips were found, the majority, over 60 per cent., of which were obtuse. In regard to the base, also, there existed considerable variation. In the larger number of leaves, about 55 per cent., the base of the blade began at opposite points on either side of the petiole, in the remainder the blade began at the base at alternate points on the petiole. In the manner in which the leaf narrowed from the middle to the base, there was again much variation. The venation, of the type known as camptodrome, appears to be much more constant than any of the foregoing characters. In general the two large lowermost secondaries, and the tendency of the tertiaries and quaternaries to form quadrangular areolae are especially noteworthy.

Finally, this study tends to show that the practice of paleobotanists in placing more stress for purposes of identification on the venation than upon what might be called the external characters is a sound one.

Mr. F. D. Kern, of the agricultural experiment station of Indiana, gave some of the results of his critical work on the cedar-apple rusts, a group of heteroecious fungi, *i. e.*, fungi which have in their life-histories two or more stages which stages usually occur on different kinds of host plants.

In working out the life-histories of the cedar rusts several unusual species have been found. There are two species which are especially worthy of mention.

It may be said at first that such a large number of the cedar rusts have been found to have their complementary stage on the apple family that it has been assumed by some workers that all cedar rusts would behave in this manner. It was, therefore, with considerable surprise that one species has been found which has its alternate stage on an herbaceous plant of the rose family, a far different host from the woody plants of the apple family. While working on the Garden collections during January of 1908, a rust was discovered on this rosaceous host (*Porteranthus stipulatus*) and from a study of its form it was decided that it must be associated with a cedar rust. There were two collections of it known, one from Perryville, Mo., and the other from Mammoth Cave, Ky. It was thought that a trip to one of these places might result in the finding of a cedar rust which would be associated with it. Mammoth Cave was selected as the better place to visit, as the country is in a wild condition, and a subsequent trip there revealed a rust on red cedar which was afterwards proved to be associated with the rust on the rosaceous plant.

Most of the rusts of the apple family which are related to the cedar rusts have a peculiar characteristic form. There has been one, however, from the western coast which was so unlike the others that when it was described the remark was made that it could not belong to a cedar rust. Recent cultures have shown that this assumption was an error and that in spite of its unusual form it is beyond question related to a cedar rust.

At the close of the regular programme, Mr. Norman Taylor gave a brief account of his recent trip to the West Indies, a more detailed account of which appeared in the January JOURNAL.

FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. W. A. Murrill, assistant director, returned from Mexico January 29 with 3,300 specimens of fleshy and woody fungi, collected at various elevations from the vicinity of Cordoba and

Jalapa on the east to Colima and Tecoman on the west. Accompanying the collection are 120 colored illustrations of the more perishable species, drawn by Mrs. Murrill. Many interesting original photographs were also secured. A full account of this expedition will appear in the JOURNAL for March.

Dr. Raymond H. Pond, plant pathologist of the Texas Agricultural Experiment Station, College Station, visited the Garden last month on his return trip from the Boston meeting of the American Association for the Advancement of Science. Dr. Pond held a research scholarship at the Garden at various times from 1905 to 1907, and for several months was biologist of the Metropolitan Sewerage Commission of New York City.

Volume 9, part 3, of "North American Flora" appeared February 3, 1910. This part contains descriptions of the Boletaceae and Chantereleae by Dr. W. A. Murrill; and the Lactarieae (pars) by Dr. Gertrude S. Burlingham.

Dr. Charles Reid Barnes, professor of plant physiology in the University of Chicago, died on February 24. Professor Barnes was born in Madison, Indiana, in 1858; and was educated at Hanover College, Indiana, and at Harvard University. He has been best known as a teacher of general plant physiology, as a student of the taxonomy of mosses, and as co-editor of the Botanical Gazette.

The danger to buildings from the dry rot fungus (*Merulius lacrymans*) has not been recognized in this country as it has in Europe and builders have been allowed to use unseasoned wood to a large extent. A recent investigation in New York City by Professor I. H. Woolson, of Columbia University, brought to light an astonishing condition of affairs in a great number of wooden buildings, which may collapse as did the Gledhill factory unless speedily repaired.

The gray squirrels in the Hemlock Grove have found the severe winter very trying without their accustomed store of chestnuts. Mr. E. W. Humphreys recently observed one of them making a meal on *Stereum hirsutum*, a leathery fungus occurring commonly on dead wood, which would seem unpalatable to the last degree. During the summer, squirrels are very

fond of species of *Russula*, and other fleshy forms appearing on the forest floor, and red squirrels in Alaska have been known to carry fleshy forms into the trees and preserve them for future use; but I believe this is the first instance recorded where a tough form like *Stereum* has been so used.

Meteorology for January, 1910. — The total precipitation recorded for the month was 6.38 inches.

Maximum temperatures were recorded of 52° on the 2d, 40.5° on the 16th, 50.5° on the 22d, and 44° on the 24th. Also minimum temperatures were recorded of 3° on the 4th, 11° on the 11th, and 19.5° on the 26th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

1,304 specimens of flowering plants from Utah. (By exchange with U. S. National Museum.)

94 specimens of *Crataegus* from Missouri. (Collected by Mr. E. J. Palmer.)

67 specimens of tertiary fossil plants from Florissant, Colorado. (Collected by Messrs. Willard Rusk and Terry Duce.)

1 specimen of fungus from Durango, Mexico. (Given by Mr. Charles Shelby.)

50 specimens, "Uredineen," fascicle 46. (Distributed by Professors H. and P. Sydow.)

1 specimen of chestnut canker from the Arnold Arboretum, Jamaica Plain, Mass. (Presented by Mr. R. W. Curtis.)

25 specimens of fungi from Pennsylvania. (Given by Professor D. R. Sumstine.)

1 specimen of *Spongipellis delectans* from Indiana. (Collected by Mr. C. C. Porter.)

3,300 specimens of fungi from Mexico. (Collected by Dr. and Mrs. W. A. Murrill.)

14 specimens of Polyporaceae from Washington. (Given by Mr. Elam Bartholomew.)

1,003 specimens of algae, mosses and hepatics from Panama. (Collected by Dr. M. A. Howe.)

2 specimens of *Inonotus hirsutus* from Mississippi. (Given by Dr. Hermann von Schrenck.)

28 specimens, "Ascomycetes," fascicle 45. (Distributed by Dr. Heinrich Rehm.)

1 specimen of *Elfvingia fasciata* from Mississippi. (Given by Dr. Hermann von Schrenck.)

95 specimens of miscellaneous flowering plants. (By exchange with the United States National Museum.)

10 specimens of mosses. (By exchange with the Sullivant Moss Society.)

33 specimens of mosses from Connecticut and West Virginia. (Given by Professor John L. Sheldon.)

6 specimens of mosses from Troy, Jamaica, W. I. (Collected by Mr. J. King Brown.)

20 specimens of mosses and hepatics from Santo Domingo. (Collected by Mr. Norman Taylor.)

2 specimens of Polyporaceae from Ohio. (Given by Professor A. D. Selby.)

20 specimens of mosses from France. (Given by Brother Leon.)

26 specimens of woody fungi from Ohio. (By exchange with Mr. L. O. Overholtz.)

PLANTS AND SEEDS.

17 plants from Panama. (Collected by Dr. M. A. Howe.)

3 plants for the conservatories. (By exchange with Mr. Frank Weinberg.)

19 plants from Santo Domingo. (Collected by Mr. Norman Taylor.)

1 plant of *Hibiscus schizaepetalus* for the conservatories. (Given by Mr. Esmonde Whitman.)

1 plant of *Opuntia* from Mexico. (By exchange with the United States National Museum, through Dr. J. N. Rose.)

11 packets of seeds from Santo Domingo. (Collected by Mr. Norman Taylor.)

1 packet of seed of a *Pentstemon* from Colorado. (Collected by Dr. H. H. Rusby.)

12 packets of seeds. (By exchange with Botanical Garden, Penang.)

5 packets of palm and cycad seeds from Mexico. (By exchange with Dr. J. E. Harvey.)

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EDITOR

PERCY WILSON

Administrative Assistant

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COLLECTING FUNGI IN SOUTHERN MEXICO.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: Following your instructions, I sailed from New York, accompanied by Mrs. Murrill, on the S.S. "Merida" of the Ward Line, December 2, bound for Veracruz, the special object of the expedition being to secure specimens and descriptive notes and drawings of the higher fleshy and woody fungi, which have heretofore been very imperfectly known from Mexico.

Cuba was reached at sunrise on December 6, and the ship remained in the harbor at Havana all day. On the morning of December 8, we anchored in twenty feet of water four miles from Progresso on the coast of Yucatan and went ashore in a steam tug. The town is small and uninteresting except for the immense amount of henequen fiber that passes through it as the chief port of Yucatan. About 500 ships call at this port during the year, mostly for henequen. Large storehouses for the bales of fiber may be seen along the beach. The sandy soil supports little vegetation, the sea grape, some species of cacti and a few cocoanut and almond trees being the chief plants noticed.

The train for Merida, the capital of Yucatan, left Progresso about the middle of the forenoon and traversed the twenty-two miles in an hour, first crossing a broad lagoon near the coast, filled with mangrove, and passing for the remaining distance through the very extensive heniquen plantations for which Yucatan is famous. The bed of coral rock which constitutes the only soil here seems particularly well adapted to the formation of fiber

of good quality, a richer soil producing weak fiber and an excess of fleshy tissue in the leaf.

Henequen, or sisal, is the commercial name of the fiber of *Agave rigida*, known to the Yucatecos as *sacci*. The ancient Mayas used this fiber for making the ropes with which huge stones were dragged to the summits of their pyramids and temples. There are now about four hundred plantations in Yucatan, comprising about a million acres, which yield 600,000 bales a year, valued at twenty million dollars. The plants are propagated from sprouts, cuttings, or seed. Very little preparation or cultivation of the soil is necessary. Six or eight years after planting, the two lowest rings of leaves are cut, and this is continued each year for eight or ten years, when the plant produces a long flower-stalk and dies. The instrument used for cutting the leaves, called *corba*, is something like a *machete*, but is hooked at the end. The cut leaves are stripped of their spines and mashed to a pulp in huge crushers, after which the mass of fibers, about a yard in length, is cleaned, combed, dried, and compressed into bales for shipment. The fiber is woven into ropes, binder-twine, etc. In Yucatan, very fine hammocks are made of it, which sometimes sell for a hundred dollars or more.

Merida is now a very attractive city of 45,000 inhabitants, with splendid streets and a perfect system of sewerage, presenting the strongest contrast to conditions there a few years ago. The section occupied by the homes of owners of henequen plantations is particularly attractive. A feature of Merida is the great number of windmills employed. The porous nature of the coral rock causes the water to sink some distance below the surface, where it runs in underground currents. These currents may sometimes be reached by natural openings or caverns, called locally *cenotes*. The soil used in gardens and plazas has been brought from hills in the interior of the peninsula, and trees have been planted in openings blasted in solid rock.

At daybreak on the morning of December 9, we left Progesso for Veracruz, arriving the next day about noon, eight days after leaving New York. Veracruz is another city which has been entirely transformed in the past few years. The streets are asphalted

or well paved, perfectly drained, and lighted by electric light. Splendid breakwaters, costing fifty million dollars, now insure the safety of the numerous vessels visiting this, the oldest and most important, port of Mexico. The town is built on the level shore only four feet above the sea and contains little of botanical interest. The main plaza is well filled with large palms and other tropical plants and is the home of thousands of blackbirds, whose loud clamor continues without ceasing from daylight until dark. All efforts to dislodge these birds have proved unavailing. The buzzards, or *zopilotes*, avoid the plaza and make their home on the towers of the parochial church and nearby buildings.

Early on the morning of December 11, we left Veracruz on the Interoceanic Railway, bound for Jalapa, situated in the mountains eighty miles distant and nearly a mile above sea-level. The grade is steep, the road is of narrow gauge, and there are many stops, so it was afternoon when we reached out destination. However, the journey is full of botanical interest and we found much to observe and enjoy.

Just outside of Veracruz, there are large sand dunes containing only cacti, but these are soon left behind and the road enters the low, tropical, highly productive zone, twenty-five miles in width, lying between the village of San Francisco and the coast. During the dry season, from October to May, this zone is not so attractive as in summer, but we saw cocoanuts, oranges, several fine palms, among them the *coyol real*, which yields the palm-oil of commerce, banana patches, sugar plantations, and a number of common wild tropical plants, such as *Ricinus*, *Bursera*, *Ficus*, *Ceiba*, *Agave*, *Tamarindus*, and the like. Meadows where corn and beans had been gathered were overrun with a large orange-flowered *Coreopsis*, while the railway embankments were covered with a small pink-flowered *Convolvulus*. The rocky slopes often contained cacti. At La Antigua, after about an hour's ride, we crossed a fine river of that name, flowing through rich meadows.

Beyond the thatched cottages of San Francisco, the coffee zone begins, which extends to Jalapa. This zone also supplies bananas, pineapples, corn, and many other important products. In the woodlands, the "molatta tree" first attracted my attention because

of its large and beautiful flowers, which are white with a purple center. The trunk and branches, which were leafless at that season, are ashy-white. The tree is small, but exceedingly abundant.

Rinconado, near the battlefield of Cerro Gordo, was passed at 10 A. M., and, after traversing a broad plateau with a fine view, we came to Carrizal and then to Colorado, a region of black, fertile soil that produces great quantities of corn. Here are rough, low, limestone hills with valleys between, resembling the Cockpit Country of Jamaica. The rock-masses are much tilted and folded, and the scenery becomes rapidly wilder as the road winds about the successive hills and crosses the intervening barrancas filled with luxuriant vegetation. Palms, of various forms and sizes, are very conspicuous here, but beyond El Palmar they gradually give place to hardwood trees, on which an increasing number of bromeliads and orchids appear. A conspicuous orchid with rose-colored flowers was seen again and again.

Between El Palmar and the broad plateau on which Chavarrillo is situated, the underlying rock seems to change for the most part from limestone to granitic formations overlaid by volcanic discharges. At the same time, oaks and cycads and bracken ferns appear, to the exclusion of palms and many other kinds of plants common at lower elevations. Beyond Chavarrillo, the broad fertile plateau, covered with grass and dotted with clumps of scrubby oaks, pinguin, and opuntia, extends for many miles and supports great herds of cattle. In the midst of this plateau, the Mexican Fruit Company has recently planted extensive areas in oranges, pineapples, bananas, cherimoyers, and coffee. These are the first orchards of importance between Veracruz and Jalapa.

At Pacho, six miles from Jalapa, the plateau gives place to hills again, with coffee in abundance and splendid primeval forests extending for several miles. At 12:30 the train drew up to Jalapa, and we followed our luggage on foot through the dense crowd at the station and up the very long, narrow street leading to the principal part of the town. There were no

vehicles of any kind to be seen except a single street-car drawn by four mules, which was already filled to overflowing. Merchandise of all kinds is carried on the backs of men, ponies, or burros. The streets are roughly paved with large blocks of lava, the gutter being in the center, which is the condition found in most Mexican cities.

Jalapa is a very old town and of the greatest interest botanically, situated as it is in the midst of a primeval forest at an altitude that insures plenty of rain and moderate temperatures the whole year round. A number of medicinal plants, as well as many rare and beautiful orchids, have been collected in this forest in past years. *Ipomoea Jalapa*, a powerful cathartic familiarly known as jalap, and *Smilax medica*, or sarsaparilla, were formerly exported in large quantities.

By climbing the Cerro Macuiltepec, on the eastern slope of which the town is perched, a splendid view is obtained, with Perote to the west, Orizaba to the southwest, the forest to the south as far as the hills above Pacho, and the gradual slope toward Veracruz far away to the southeast. It is believed by many that the reefs in Veracruz harbor are caused by lava from the giant Perote, which flowed down this long incline in past ages. Nearer by, five hundred to a thousand feet below, lies the town, embowered in tropical vegetation and surrounded by cultivated fields and dense forests. Excellent water, obtained from Perote, flows from fountains in the streets, after the manner of Swiss and Tyrolean towns, and the natives, dressed in their curious costumes, filling their water jars at these fountains, make a very picturesque sight.

Over a week was spent at Jalapa, daily excursions being made to various parts of the forest, which yielded rich collections of fungi, many of which were apparently undescribed. *Polyporus xalapensis*, described from this locality by Berkeley in 1849, was found in quantity. Certain of our own species, such as *Tremella mycetophila*, collected rather frequently on *Collybia dryophila*, and *Clitopilus abortivus*, found for sale in the market, were rather a surprise to me. The woods were full of ferns, mosses, liverworts, and lichens ; while the lava walls along the roads and in the fields

were covered with xerophytic species. A species of *Selaginella*, resembling the resurrection-plant of the western plains, grew abundantly on the exposed roadside banks above Pacho. Blackberries were just beginning to ripen, while peaches were the size of small marbles, and corn was either being planted or was just showing above ground.

A visit to the market showed a profusion of interesting plant products, such as oranges, lemons, limes, sweet lemons, grapefruit, cherimoyers, sapotes chicos, sapotes negros, mammee apples, sweetcups, pineapples, tamarinds, bananas of various kinds, the best variety, called "melt in your mouth," being about as large as a man's thumb and very sweet, thornapples (*Crataegus*), a very poor native variety of apple (*Pyrus*), cocoanuts, peanuts, hickory-nuts, sweets and jellies of various kinds; sweet potatoes, pumpkins, squash, pumpkin seed, tomatoes, peppers of many shapes and sizes, ground-cherries, peas, beans, corn, cabbage, plantains, potatoes, cauliflower, yams, guavas, lettuce, parsley, onions, watercress, radishes, carrots; gardenias, camellias, cannas, callas, azaleas, bougainvillaeas, and savory roots and herbs, some for garnishing and some for medicinal use.

Practically all of this produce is brought in from the surrounding country and exposed for sale in small booths, or on the ground, by native men, women and children. Much of it is of poor quality and undersized, as though grown in sterile soil or with little cultivation. This was very noticeable in the case of the cocoanuts, peanuts and tomatoes, the latter especially being invariably small, deeply creased and badly flavored.

On December 20, the collections made at Jalapa were packed and shipped by express to Messrs. Berea, O'Kelly & Co., agents of the Ward Line in Veracruz, who kindly took charge of these and several additional shipments until my return. Shortly after noon, we left Jalapa by train for Mexico City *via* Puebla, where we spent the night. Careful notes were made of the route, which is exceedingly interesting to the botanist, but offers few opportunities for proper food and shelter. Indeed, all through rural Mexico, as in Italy, this is a problem that must be studied and solved in advance when new regions are to be visited for a stay of more than twelve hours.

From Jalapa to La Cima, a distance of nearly forty miles, the train climbs to an elevation of over 9,000 feet, passing some of the finest scenery on the eastern slope. Beyond Banderrilla, six miles from Jalapa, the first pine-trees were observed. This is the long-leaved, Montezuma pine, very abundant at high elevations in Mexico and an exceedingly important timber tree. An arborescent species of *Yucca*, probably *Y. periculosa*, is used for hedges here and at San Miguel. One sees railway ties piled up at the stations awaiting shipment. Alders and birches appear in the thickets and oaks increase in size and number; while the few peach-trees noticed are just coming into flower. The stations are far apart and only Indians are seen, selling excellent oranges and large bunches of flowers at very low prices. It is a wild grazing country, with patches of corn and large wooded areas.

Beyond Cruz Verde the road enters an immense field of lava, covering the flank of Perote, which presents the roughest appearance imaginable. The lava mass is broken into huge, jagged blocks, some of them as large as houses, their shaded sides clothed with lichens, mosses, and ferns, and the intervening spaces filled with a tangle of shrubs and pines. A few fields and coppices of hardwoods appear as oases in this area of desolation; in these, a tall red-flowered thistle is conspicuous, and the first specimens of the maguey, or century-plant, are observed, planted in hedge-rows.

At Las Vigas, the maguey becomes more abundant, and the broad plateau beyond shows extensive and splendid forests of pine in pure stand without undergrowth, which doubtless support a considerable fungous flora during the summer season, when it is warm and moist. From La Cima the great mesa stretches away to Puebla and beyond, broken only by dry hills covered with cacti, which are very abundant in the vicinity of Limon. Tepeyahualco is surrounded by maguey plantations, cornfields, and cattle ranches. On these ranches, some of the most dangerous bulls of the Mexican ring are bred.

The great tableland of Mexico is over five hundred miles wide and fifteen hundred miles long, divided into several mesas of different altitudes by mountains of great height. The two ap-

proaches to this tableland on the east, at Jalapa and at Saltillo, are utilized by the two railways connecting Veracruz and Mexico City. It was part of our plan to enter the central region by one railway and return by the other. On these immense plains, with an average elevation of 6,000 feet, wheat, corn, rye and barley are grown in vast quantities, often to the extent of two crops a year in well-watered localities. The most conspicuous plant, however, is the maguey, *Agave americana*, cultivated all over this region as the source of pulque, the national beverage.

On the way from Puebla to Mexico City, maguey plantations were almost continuously in view, with large pulque haciendas, from which trainloads of pulque are shipped each morning to the capital. The scenery is uniform except at Atotonilco and beyond, where the railway crosses the rough range of volcanic hills separating the two mesas. Wheat and corn alternate with the maguey in the valleys, yucca and cacti ornament the rocky places and serve for hedges, and straggling pines and some hardwoods crown the higher hills and barrancas; while the snow-topped Malintzi, Ixtaccihuatl, and Popocatepetl, towering from 13,500 to over 18,000 feet above sea-level, dominate the view for most of the distance.

Mexico City was reached shortly after dark, and we registered at the Hotel Palacio, near the Cathedral. An aqueduct was being constructed within a few feet of this famous church and thousands of bones of the Aztec nobility were being unearthed, which dated back to 1520, when Alvarado made his attack upon the temple. In the extension of this aqueduct along the Tacuba road, a great many interesting relics discarded in the precipitate flight of the Spaniards on "*la noche triste*" are expected to be recovered. The National Museum, containing an immense collection of objects of both historic and prehistoric interest, was closed for rearrangement and will not be reopened until the centennial celebration next fall.

On the day we reached the city, the government started to dig a lake about the tree of "*la noche triste*," under which Cortez reviewed his mutilated army, with the hope of prolonging its life. This celebrated historic tree, a giant ahuehuete, or cypress, *Tax-*

odium mucronatum, is now reduced to a mere "shell," with a few straggling branches, and I fear that, in spite of the rigid laws for its protection and the lake that is being dug about it, a few more years will end its eventful history. I would offer the suggestion that it be propagated at once on the spot by suckers or cuttings, which would really be a part of the tree itself, and that one or two of the most vigorous shoots be left to take the place of the original trunk when it is gone.

The magnificent grove of ahuehuetes adjoining the castle of Chapultepec was examined with great interest. These ancient trees, many of them 150 feet high and nearly 10 feet through, are the remnants of a great tropical forest that covered the shores of the lake that formerly filled this valley, and, being associated with important events from the time of the conquest, they are cherished and tended with the greatest care.

The Alameda, a small central park much frequented by all classes, is planted with a great variety of trees, shrubs, and flowers, and adorned with many statues. During the cold winter nights, the beds of flowers are protected from frost by heavy cloths supported on a network of wires. The past winter being unusually severe, it was necessary to use the cloths almost continuously at night and occasionally during a part of the day.

During the week preceding Christmas, a portion of the avenue adjoining the Alameda was devoted to the sale of holiday decorations and supplies of all kinds, when it presented the gayest and liveliest appearance imaginable. Large numbers of Christmas trees, closely resembling those sold in New York City, and immense quantities of Florida moss, *Tillandsia usneoides*, as well as a variety of true mosses and ferns, from the forests in the mountains to the south, were here exposed for sale; also flowers, fruits, sweets, hats, baskets, and a hundred other articles of native handiwork.

On the eve of Christmas Day, we left Mexico City for Cuernavaca, the capital of the State of Morelos, situated in the beautiful Morelos Valley, at an elevation of about 5,000 feet, and protected from north winds by the Ajusco range. This city was presented by Charles V to Cortez, who introduced sugar-cane

from Cuba and erected sugar-mills, the one at Atlacomulco being the oldest crushing-mill on the continent.

The railway journey from Mexico City to Cuernavaca is most delightful, affording a splendid view of the Valley of Anahuac, as the train climbs the north side of the great Ajusco range, and an equally fine view of Morelos Valley, as it descends the southern slope. Mixcoac, where flowers are cultivated for the city markets, San Geronimo, surrounded by strawberry fields, and Contreras, where baskets of yellow hawthorn apples are offered for sale, are soon passed, and we enter the regions of lava and forest, broken at intervals by valleys filled with corn. Ajusco, near the summit, is the center of the charcoal industry. Although pines are the most conspicuous trees here, oaks are by no means lacking, and they are cut in great quantities for charcoal. About fifteen thousand dollars worth of charcoal is consumed each day in the City of Mexico alone. Indeed, the supply of timber is being rapidly exhausted in this way and prices are increasing at such a rate that a gas company has concluded that it will now be profitable to supply the city with gas for fuel.

The train now runs for miles across a comparatively level plain, the giant crater of Ajusco, covered with coarse grass and fields of wheat and corn, dotted with volcanic hills and clumps of pine, juniper, oak, willow, and spruce or fir. La Cima, the highest point of this plateau, is nearly 10,000 feet. Beyond Las Tres Marias, the southern wall of the crater is crossed and the descent begins. The railway station of Las Tres Marias, so called from three mountain peaks to the east of it, is a collection of about fifty huts, half of them built of grass, in a low, fertile meadow where there is more or less water. It is a pity that there are no accommodations at this point for sleeping and eating, as it would be an excellent base for visiting the crater and the fringe of mountains about it, as well as the dry lava slopes and moist ravines below. There is no doubt that this region, including the barrancas near Cuernavaca, is botanically one of the richest and most varied to be found anywhere in the world. Even in the middle of winter, we found there a profusion of flowers hardly equalled on the moister and lower elevations of the eastern slope.

From El Parque the descent is very rapid, and, leaving the pines behind at Alarcon, we soon reach the orchards and cornfields of Ramon and then the picturesque town of Cuernavaca, situated at 5,000 feet elevation on a ridge between two barrancas, and commanding a superb view of the valley on all sides, with its encircling mountains, among which the snowy tops of Popocatepetl and Ixtaccihuatl appear on the eastern horizon.

We made our headquarters at Cuernavaca for five days, collecting in the barrancas and gardens from San Antonio on the west to Chapultepec on the east, and climbing the mountain side to the north. The town is of great interest historically, as well as botanically. The state capitol was once the palace of Cortez, and here the great conqueror spent some of the last years of his life. Hotel Morelos, built in 1569 by one of Cortez' generals, has had an eventful history, having been used as a fortress both by friends and foes of the government on several occasions. Its roof and patio are now filled with flowers and tropical foliage plants, making it one of the most attractive buildings of its kind. Great climbing plants of *Bougainvillaea*, with crimson or purple flower-bracts, are abundant here and elsewhere in Cuernavaca. Many spineless specimens of *Opuntia* were also observed in cultivation in the gardens there.

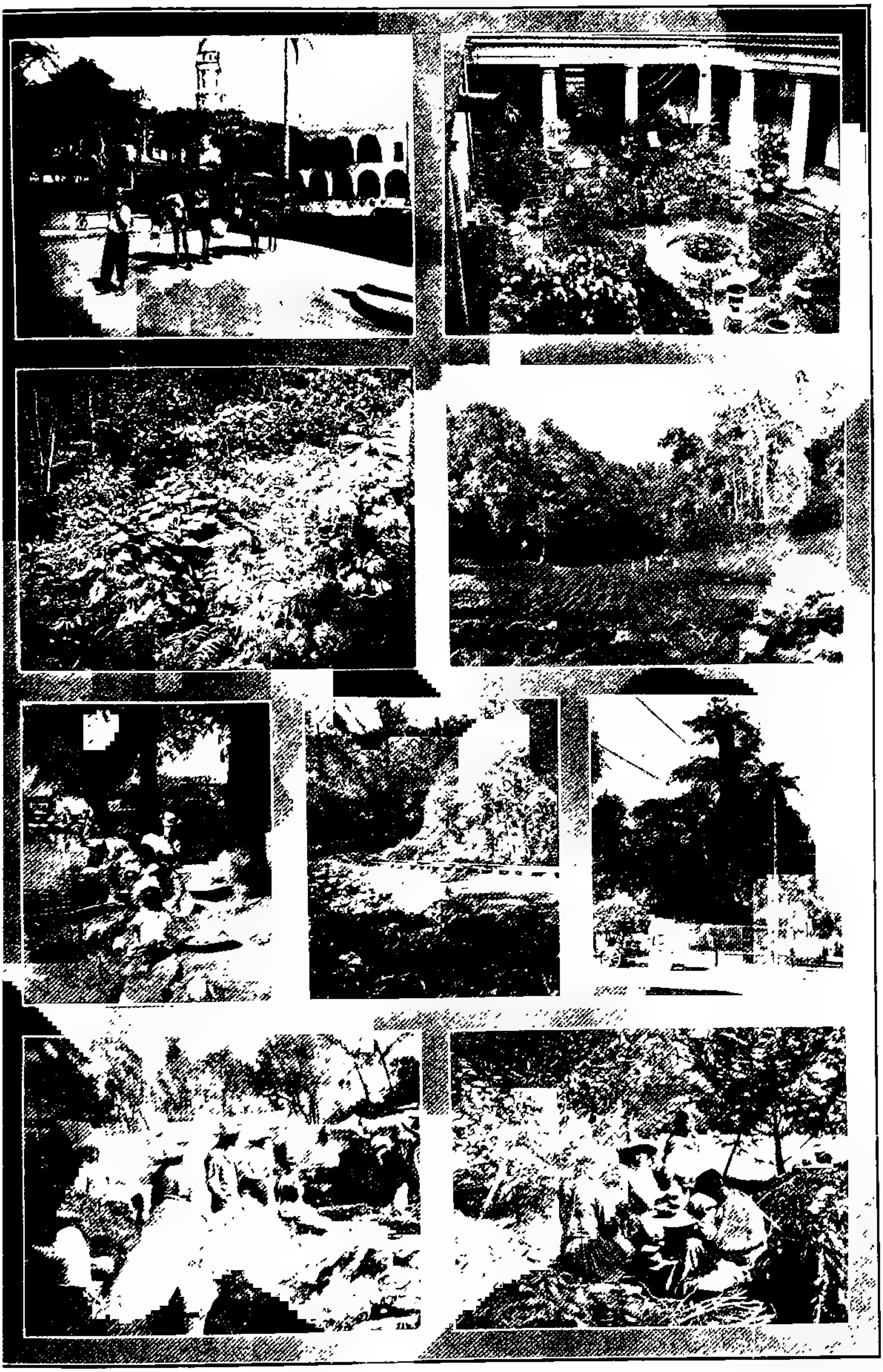
Borda Garden, once a magnificient example of the formal, Italian style, constructed at a cost of half a million dollars, is finely situated in a prominent part of the town, but is now sadly neglected as a garden, having become little more than an orchard of mango and sapote trees and coffee bushes, although still beautiful because of its basins, fountains, terraces and pergolas.

On December 28, an excursion was made on horseback to the Tepeite Valley, fourteen miles distant, on the southern side of Ajusco, 2,000 feet above Cuernavaca. The name means "Valley in the mountains," and it is reached by a tortuous, rough trail, which is very tiresome both to horse and rider. Leaving Cuernavaca at early dawn, we reached the edge of the valley as the sun rose over Popocatepetl and the ruins of Tepoxtepec, then followed the trail up the mountain until we came to a hut near the Tepeite River, where we left our horses and lunch, and proceeded

on foot four miles farther, collecting as we went. This region was moist and very rich in fungi, as well as in ferns, mosses, and epiphytes. Being generally known only to charcoal-burners, it is doubtful if it has ever before been visited by a botanist. Quantities of deer, wild pigs, cats, and other animals live undisturbed in this primeval forest. We secured 175 numbers of very interesting fungi and returned to Cuernavaca by sunset. It would be useless to attempt to give here any adequate idea of the flora of this valley.

On the afternoon of December 29, we left Cuernavaca for Colima, arriving December 31, after a continuous railway journey of over twenty-four hours from Mexico City. For most of this distance, our route lay through fertile valleys similar to those already described, the elevation at Guadalajara being 5,000 feet, or 2,500 feet lower than Mexico City, and the descent to Colima being a further drop of 3,500 feet. The climate at Guadalajara is very similar to that at Cuernavaca, only it is more exposed to north winds. On the way to Colima, the temperature gradually increases and the vegetation becomes more tropical, but, during the dry season, collecting must be confined chiefly to the barrancas and river valleys.

At Mazatepec, about an hour's ride from Guadalajara, are large storage reservoirs for irrigating the valley below, and not far beyond is the Hacienda Bella Vista, surrounded by sugar-cane fields. There are also cornfields about Santa Ana, where peons were gathering corn and loading it upon heavy oxcarts with wooden wheels, similar to those seen in the cane-fields of Cuba. Beyond Zocoalco there is considerable nopal and organ cactus, which form a part of the regular vegetation from this point all the way to the ocean. Between Zayule and San Nicolas, the train climbs a steep ridge over 5,000 feet above sea-level, affording a magnificent view of the long valley already traversed. Here were the first plantations of *Agave* seen since leaving the valley of the Lerma, and it proved to be quite a different plant from the pulque-plant of the tableland, the leaves being slenderer and more densely clustered, with a distinct bluish tint. This is the *maguey de vino*, the source of the Tequila



Main Plaza, Veracruz.
Bank of Ferns near Jalapa.
Washing under Willows, Jalapa.

Patio of Grand Hotel, Jalapa.
Planting Corn near Jalapa.
Tree of "La Noche Triste," Mexico.

liquor, so called from the district where it is chiefly produced, and an important plant of the state of Jalisco.

At Zapotlan, the usual base for the ascent of Colima and Nevado, we had lunch at the Chinese restaurant, and, continuing our journey through the very dusty plain, we reached Tuxpan and the valley of the Tuxpan River, where the splendid scenery begins, reminding one of the ascent of the eastern slope below Jalapa. The railroad has only recently been completed through to the Pacific, at an immense cost, passing through tunnel after tunnel and crossing scores of barrancas of great depth which join the great cañon formed by the river. The lowest rock seen was limestone, but there is much igneous rock and lava, the different strata showing very distinctly at many points along the cañon, where they reach a total thickness of 500 to 1,000 feet. The plain above the cañon, well shown at Platanar, rises in two terraces, each 300 feet or more in height, while the Volcan de Colima and the snow-capped El Nevado, its extinct twin, in the background, reach an elevation of 12,000 to 14,000 feet above the sea.

Shortly before reaching Colima, the capital of the very small state of Colima, the train leaves the rugged Tuxpan Valley and crosses over to the fertile region drained by the Colima River, where there are broad plantations of sugar-cane, corn and rice. The town dates from 1523, and its population of 20,000 shows a good percentage of Spanish blood. It is situated at an elevation of 1,500 feet, on a gentle slope facing the Pacific, which is about thirty miles distant.

We spent only four days at Colima, the season being too dry for fleshy fungi. One forenoon was spent in a large orchard in the suburbs and the afternoon in an abandoned ranch near the town. A barranca at Balcon, three miles to the east, reached by a beautiful calzada, was also visited. This entire stretch of road-way was shaded by magnificent fig-trees, alive with parrots, and enclosed on both sides by high lava walls, on which hundreds of iguanas were sunning themselves. In this barranca we found an interesting species of climbing cactus, which appears to be unde-scribed. Cuttings of it were brought home for propagation. We

owe much to Mr. Vose, an American civil engineer at Colima, for valuable information and assistance.

During our stay in Colima, we visited Monsieur A. Le Harivel, formerly one of Maximilian's soldiers, who is much interested in fiber plants and has a number of species growing in his garden. He also showed me growing specimens and gave me cuttings of the *candelilla*, or wax-plant, which grows in the barrancas above Colima and supplies a vegetable wax that is coming into use for phonographic records. The cylindrical, green stems, reaching a yard in length and filled with milky juice, are ground and boiled, when the wax rises to the top and is taken off and pressed into blocks, which sell in New York at thirty-five cents per pound. The plant appears to be a species of *Pedilanthus*, or possibly an *Euphorbia;* this can be better determined when the cuttings have developed leaves and flowers.

The only considerable journey made from Colima as a base, was to Tecoman and the west side of the valley of the Armeria River, which rises in the state of Jalisco and flows south through the center of the state of Colima, receiving the Colima river below Coquimatlan. Leaving Colima at 6 A. M., I reached Tecoman at 8:40 and walked six miles farther, following the west bank of the river until the first tributary was reached and working both sides of this stream for a distance of nearly two miles, returning to Colima at 7 P. M.

This journey was of special botanical interest, being on the Pacific Slope in a region not well known, with elevations from 1,500 down to 150 feet. At the first station below Colima, the large and attractive fruits of some cactus were sold by the Indians under the name of "pitalla" or "pitaya." They were spherical in shape and nearly as large as oranges, with greenish-purple skin and red meat. After crossing the river and entering the rough limestone hills, a species of *Cereus*, more slender than the giant cactus, was noticed in abundance on the exposed, thinly wooded slopes. Between Madrid and Caleras there was a fringe of low, wet woods and broad meadows filled with rice, which is the principal crop of this region. The natives here are very dark and wear wide, white trousers with red sashes. Their huts are

CASTLE OF CHAPULTEPEC, MEXICO.
CUERNAVACA, LOOKING WEST.
DINING-ROOM OF HOTEL MORELOS.

LAS TRES MARIAS STATION.
EL PARQUE STATION.
PALACE OF CORTEZ AND MARKET.

made of grass, consisting mainly of a roof for shade, and they sleep in hammocks. The state laws are very rigid. For example, animal charcoal may not be used for bleaching sugar, because it is made from old bones; and all flour must be made from the entire wheat grain.

The walk across the great desert plain surrounding Tecoman was not less interesting than the railway journey. On the right is a semicircle of blue mountains overtopped by the volcano of Colima; on the left the plain slopes gradually to the shore of the Pacific, a few miles away. Scattered over the plain are oases of shade, where tall, spreading cacti and spine-bearing trees ward off the surrounding desert with interlacing branches. Careful search revealed only three species of cacti, the nopal, the organ cactus, and a quadrangular, straggling or climbing species, all of which were abundant. The first bore green fruit, the second purplish flower-buds, and the third was entirely bare. A few cattle cropping the dry grass, a silent mocking bird or two, a red squirrel gnawing the fruits of a species of *Rhamnus*, and long files of large, red, leaf-cutting ants, each with a piece of leaf held aloft after the manner of a sunshade, composed the only visible animal life. These ants, determined by Professor Wheeler as *Atta mexicana*, carry quantities of leaves into their underground nests and cultivate upon them as they decay a species of fungus, which they eat. A closely related species with similar habits occurs in Texas.

On entering the dense jungle lying between the west bank of the river and the higher portions of the ridge of hills which shuts it off from the ocean, the scene is entirely changed. Yellow-billed parrots, fat ground pigeons, large, lazy butterflies of brilliant colors, lizards, snakes, squirrels, pigs, deer, pumas, jaguars, and many other animals inhabit this jungle in abundance. Many speies of fungi were found on the dead and decaying timber, but it was too dry for species growing on the ground. To secure these, the region should be visited a month or two earlier, before the rains have ceased. At one point where I waded the stream, the water-lettuce of Florida, *Pistia Stratiotes*, was abundant on the surface of the water, beneath large, overhanging palms of the genus *Cocos*.

A short distance beyond Tecoman, a lagoon begins, which continues to Manzanillo. I had planned to collect along this lagoon near the ocean, but, learning from Dr. L. A. Turnbull that it was infested with alligators and various fevers, and that the accommodations at Manzanillo were of the poorest kind and the trains exceedingly slow, I abandoned the idea and determined to return to the Gulf Slope, where there was more moisture. Accordingly, we left Colima January 5, and reached Mexico City January 7, breaking the journey at Guadalajara. On January 8, being Saturday, I was induced to join an automobile excursion to the buried city of San Juan Teotihuacan, thirty-two miles northeast of the capital, not only because of the great interest attached to the ruins, but also because of the opportunity it afforded me to observe at close range the extensive maguey plantations and cactus thickets along the route.

The most conspicuous objects in the precincts of the sacred city are the pyramids of the sun and moon, constructed of basaltic blocks and trachite by some tribe antedating the Toltecs. The larger structure is 216 feet high, with a very broad base. When the excavation of the city has proceeded further, more light will doubtless be cast on this ancient tribe and the history of these almost unknown ruins. It is interesting to note that a Temple of Agriculture occupies a conspicuous place in this city, reminding one of the zealous worship of the goddess Ceres.

The common maguey, or pulque-plant, reaches its best development at this altitude and is very abundantly cultivated. This plant has been the source of a variety of useful products, such as paper, twine, parchment, thatching, vinegar, molasses, and even needles and thread; but it is now cultivated almost entirely for pulque and mescal, the former obtained by fermentation of the sap stored up for flowering, and the latter by distillation from the root and lower leaves after roasting. The plants require little attention until old enough to flower, which generally occurs when they are from eight to ten years old. When the giant flower-clusters are about to be produced, harvesters go through the plantations and cut out the incipient stalks, at the same time scooping out a sort of basin, into which the sap flows and is col-

lected, to the extent of a gallon or more each day for two or three months, or until the plant dies of exhaustion. The sap is drawn from the basin by suction through a long gourd, or *acocotc*, the fruit of a species of calabash, *Lagenaria vulgaris*, and taken in pig-skins or sheep-skins to the fermenting-rooms, where the addition of old pulque converts it into the pulque of commerce within twenty-four hours. The finished product resembles diluted yeast and contains about 6 per cent. of alcohol. If kept longer than a day or two, it becomes stale, a fact which the natives fully appreciate.

The nopal cactus, *Opuntia tuna*, also thrives best on the table-land, but is found in abundance at lower elevations. The fruit of this species, called *tuna*, is large and attractive, and is greatly esteemed by the Mexicans. The plants are used for hedges, while the young pads are eaten by cattle and made into a stew or preserved as confections by the Indians. Being abundant and conspicuous, as well as useful, the nopal has been used in designs for Mexican coins and for the national banner.

The organ cactus, *Cereus excelsus*, with its cluster of tall, fluted cylinders resembling organ-pipes, is one of the stateliest plants seen in Mexico. It bears purple flowers near the apex of the cylinders, but the fruit is of little importance.

The cochineal insect, which feeds on certain species of *Opuntia* resembling the nopal, develops best in the state of Oaxaca, said to be the original home of the cochineal industry, where it is now much reduced on account of the discovery of aniline dyes.

Both going and returning along the shores of Lake Texcoco, I saw countless flocks of migratory ducks of various species feeding upon the rich animal life of this lake. Here the curious and remarkable water-lizard, or *axolotl*, eaten by the Indians, makes its home; and here are deposited, among the rushes or on bundles of reeds placed there for the purpose, the eggs of the peculiar marsh-fly, *Ahuatlea*, which form a staple article of food among the Tezcucans.

On Sunday, January 9, we were entertained at the home of Dr. and Mrs. Hardin, in Mexico City. Dr. Hardin is the author of an important treatise on the Liquefaction of Gases, and is at

present Treasurer of the Mexican National Gas Company, which is spending $2,000,000 on an initial plant for lighting and heating, to be ready for service this spring.

On the morning of January 10, we left by the Mexican Railway at an early hour for Orizaba, arriving at 3:30 P. M. The railway journey is of great interest, especially during its latter stages. The pyramids of the sun and moon; the famous battlefield of Otumba; the Plain of Apam, as celebrated for pulque as Munich is for beer; Soltepec, with its magnificent view of the four great mountains, Popocatepetl, Ixtaccihuatl, Malintzi, and Orizaba; and Apizaco, the supply station for canes made of various native woods, are all passed in the first three or four hours.

Beyond Rinconada, thin woods appear on the mountain flanks and subtropical trees hung with Florida moss fill the ravines, but these are soon passed and the great fertile plain comes into view that extends unbroken to the base of Orizaba. This plain is practically one vast field of wheat, with long rows of ripened grain, and threshing-machines at work, and also the primitive threshing-floors of the Egyptians, where horses are rapidly circling over a floor of pounded earth. The stacks of straw are made with the greatest care and properly dedicated, so as to insure them against lightning. Wheat has been planted in Mexico since 1530, and the crop is considered of the best quality.

From the station of San Andres, a branch line runs to Chalchicomula, the point of departure for the ascent of Orizaba, the monarch of Mexican mountains (18,225 feet) and, with the exception of Mt. McKinley, the highest peak in North America. It was first ascended in 1848, by a party of General Scott's officers, and the journey is frequently made now without much difficulty. A fine view of Orizaba was obtained at Esperanza, where we stopped for dinner. Here, on the edge of the great tableland, 8,000 feet above the sea, the train is inspected and prepared for its plunge to the coastal plain.

As we begin to circle the base of Orizaba, we suddenly leave the desert and feel the first rain we have seen since leaving the mountains above Jalapa; and the change from parched earth and cactus to green grass and luxuriant vegetation is very delightful.

POTTERY PLANT, SAN ANTONIO
CARTS WITH CORN, VERDIA
COLIMA, LOOKING TOWARD VOLCANO.
CALZADA EAST OF COLIMA

STOVE AND COOKING UTENSILS.
MAIN PLAZA, COLIMA.
SELLING FRUIT, COLIMA.
BARRANCA EAST OF COLIMA.

The journey of thirty miles from this point to Orizaba, a drop of 4,000 feet, is through some of the most splendid scenery to be found anywhere.

Orizaba is a celebrated resort for both summer and winter, having the right elevation (4,000 feet) and being charmingly situated in a picturesque mountain valley. The frequent rains and fogs, which sometimes discourage the tourist, are an inspiration to the mycologist, who finds after each season of downpour a fresh crop of interesting fungi.

On January 11, I went by street-car to Rio Blanco and followed a stream from that point up into the mountains, obtaining as many specimens as my baskets would hold. The next day, we drove to Rincon Grande and collected in the ravine near the falls and in the forest above, obtaining many fleshy fungi and a considerable number of mosses, liverworts, and ferns, which cover the moist, limestone cliffs here in great profusion. The third day was spent on horseback in the coffee plantations, where the rich humus and the remains of old stumps and logs yielded many fungi of interest. On account of the damp weather, all these specimens had to be dried over the folding stove which we had in our outfit.

Orizaba is one of the great coffee centers of Mexico, being the largest town in a coffee district of 700 square miles, which extends as far down as Paso del Macho. Banana plants are used to shade the coffee bushes, which, with proper warmth and moisture, begin to yield in three or four years. The crop was just maturing while we were there and natives were picking the red berries and drying them on level cement floors, preparatory to hulling and shipping the beans up to the large storehouses at Esperanza, where the air is dry. The annual export of coffee from Mexico amounts to about $6,000,000 in value. The flavor of coffee, like that of tobacco, depends quite as much upon its treatment after picking as before. Good coffee may be grown in almost any locality where the soil is rich in humus and well drained, and the altitude and latitude such that plenty of moisture, with a temperature never below 50° Fahr., will be insured.

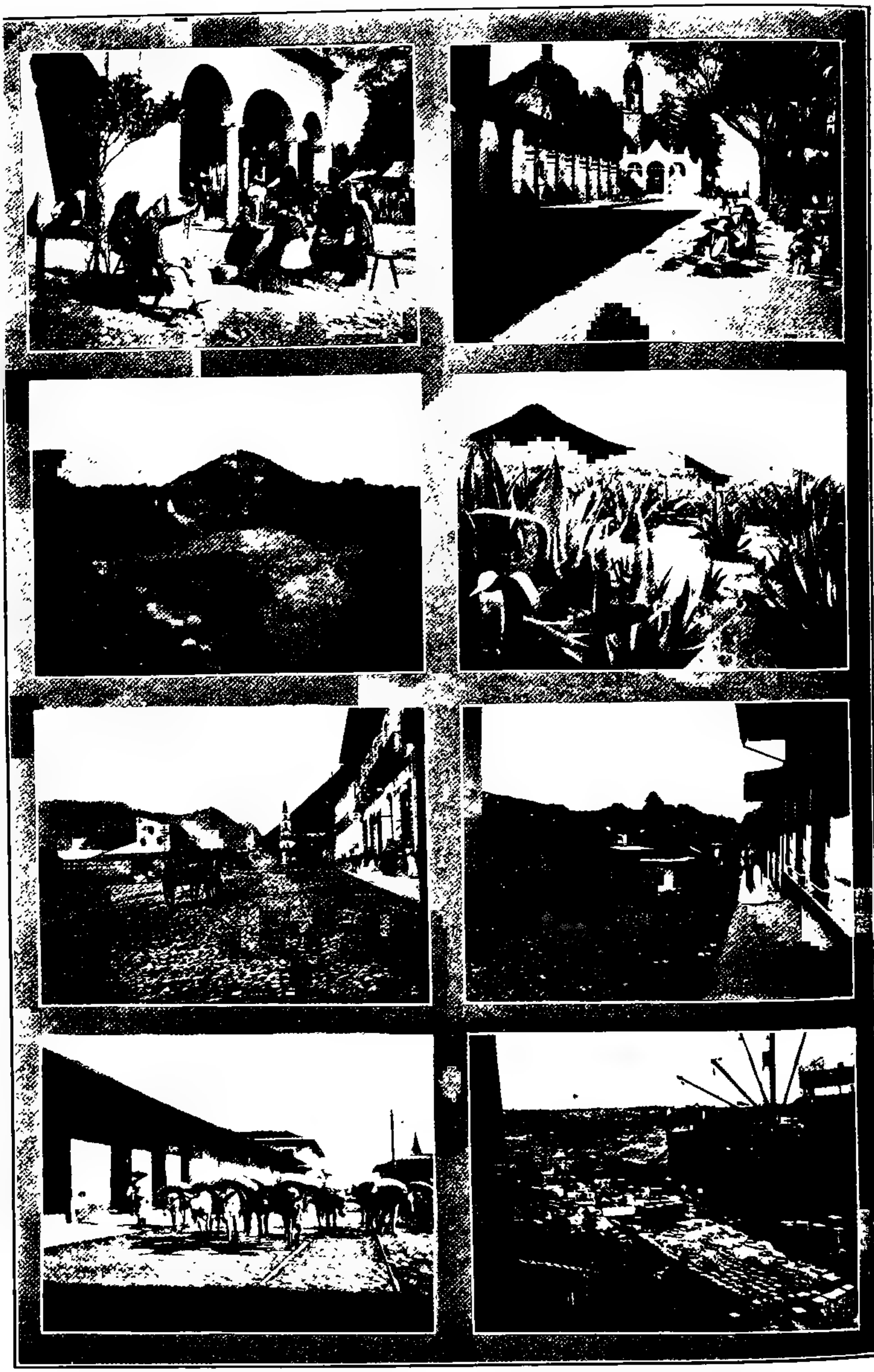
The market in Orizaba is well worth visiting at this season.

There is the usual profusion of vegetables, fruits, and flowers, with dried meats and peppers, nuts, sweets, cereals and beans. Artichokes, resembling misshapen white turnips, were abundant. Muskmelons, small watermelons, red radishes 12 to 18 inches long, olives, pads of nopal cactus, Italian chestnuts, oysters, and turtles were among the specialties. The flower girls offered roses, violets, Easter lilies, gardenias, camellias, pinks, pansies, geraniums, azaleas, wreaths of moss, potted plants, and packages of various flower seeds.

On the afternoon of January 14, we left Orizaba, at an elevation of 2,700 feet, arriving at 5 P. M., just after the heavy storm which had swept the Eastern Slope for about a week. On account of this rather unusual general rain, I decided to take advantage at once of the excellent opportunity it afforded of securing fleshy fungi at low elevations during the winter season; accordingly, I left early the following morning by the Veracruz and Isthmus Railway for Motzorongo, 25 miles southeast of Cordoba, at an elevation of only 800 feet, where I secured the largest collection obtained during any single day while in Mexico.

Motzorongo is in the midst of a sugar plantation owned by the Motzorongo Company, of which Mr. E. E. Wünsch is manager. I was received with great cordiality by Mr. Wünsch and advised to try first the steep ridge on the west of the valley, where considerable cutting had been done to obtain firewood for the sugar-mill. I found the dead logs and the floor of the dense virgin forest covering the side and summit of this ridge, which rises 600 feet or more above the valley, teeming with fungi of the most interesting kinds, and I devoted the entire day to this locality, without stopping for food or water until shortly before the returning train was due.

I was compelled to spend the next day in working up this collection, but the day following, leaving Mrs. Murrill in charge of the drying, I went in the same direction as far as Xuchiles, 15 miles from Cordoba, at an elevation of about 1,500 feet, and collected during the forenoon in the coffee and banana plantations along the south bank of the Rio Blanco, where there was considerable dead wood left from the original forest. In the after-



San Pedro, Guadalajara.
Pyramids of Sun and Moon.
Main Street, Orizaba.
Main Plaza, Texcoco.
Maguey Plantation, Texcoco.
Cordoba, looking toward Mountains.

noon, I followed the railroad north as far as the Seven Waters and then cut across the pastures and through the coffee groves for several miles to Cuichapa, where I boarded the 5 P. M. train for Cordoba, returning with nearly as many specimens as on the previous trip.

This whole region about Cordoba is of great botanical interest, and is easily accessible by railways running in four different directions. In the immediate vicinity, are plantations of sugar-cane, bananas, pineapples, mangoes, coffee, and tobacco; while the town itself, with only 7,000 inhabitants, can hardly be seen from a distance on account of the gardens and groves which surround it.

Late in the afternoon of January 19, we left Cordoba for Veracruz, where our steamer awaited us. The station was filled with crowds of natives, some of them from the interesting Indian village of Amatlan, with segments of bamboo containing tuberoses and bunches of the best banana, the fat, yellow *Dominico*, which, unfortunately, cannot be shipped more than a few miles.

The journey to Veracruz was made mostly after nightfall. At El Potrero, there are mountains which should furnish good collecting for a day, at least; and the ravines about Atoyac might also be visited. Paso del Macho is in a vast plain resembling that at Tecoman, only not so dry. This plain gradually descends to the coast, the last range of blue hills having been left behind soon after leaving Atoyac.

On the morning of January 21, we embarked on the S. S. "Esperanza" with all of our collections, comprising 1,250 numbers, or about 3,300 specimens, of fungi, besides some mosses and other miscellaneous plants, and, after being held inside the breakwater for twelve hours by a terrific "norther," started for New York, arriving January 29.

It will be some time before this collection of fungi can be thoroughly examined, but it is estimated that half of the species have not been reported before from Mexico, and that between fifty and one hundred are undescribed.

Respectfully submitted,

W. A. MURRILL,
Assistant Director.

SKETCH OF THE CRATAEGUS PROBLEM, WITH SPECIAL REFERENCE TO WORK IN THE SOUTH.*

My first critical work on the genus was begun in Vermont, June, 1899. Dr. Brainerd and I searched western Vermont thoroughly, supplying Dr. C. S. Sargent with our material. I made several trips to Montreal, one to Rivière du Loup, Quebec, and another to the Berkshire Hills, Massachusetts. In the summer of 1903, two long trips were made in Vermont, for the Arnold Arboretum.

In 1904, upon coming to the Garden, I commenced a special study of the group.

The first thing necessary was the collection of a *Crataegus* herbarium. This has gradually been accomplished, and to-day we have what I consider the best *Crataegus* herbarium in the world. This was accomplished, first, by the aid of many botanists who had collected for Mr. Ashe and Dr. Sargent. I immediately sent out a circular letter to those people asking them to collect specimens from the type trees. Nearly all of them responded and thus we have secured material that has helped to settle many problems. Later, in the spring of 1907, I sent out a circular of instructions for collecting *Crataegi*; this was sent mostly to botanists in the South and West and has secured more desirable specimens, which are still coming in. Since then I have paid special attention to material from parts of the country from which no collecting had been done.

Second, my own collections have added largely to the herbarium. In the fall of 1904 I spent five weeks in the field visiting many places in Vermont, several localities in Connecticut, the Berkshire Hills and the Arnold Arboretum in Massachusetts, and a number of localities in eastern Pennsylvania. In 1905 my collecting was done from New York City north to Dutchess County, New York. Since then trips have been made to the Arnold Arboretum and several extensive ones in the south.

Third, our herbarium has been much increased by a complete set from the Biltmore Herbarium. Mr. Beadle sent collectors

* This paper was read at the regular conference of the scientific staff and students of the Garden, on February 2, 1910.

all over the South, for a number of years, and thus had much material; but the botanical work of the Biltmore Estate was stopped in 1904 and the only way to get material was to go there and select it. Mr. Beadle very kindly allowed me to make this selection.

Fourth, by a large set of material selected from Mr. Ashe's types. This Mr. Ashe allowed me to do on my first visit to him in December, 1907. This visit was very essential, for no one had seen his *Crataegus* herbarium. Before examining this collection there were at least seventy-five of his species that I did not know, and could not even assign to groups.

Along with the herbarium construction I started a card catalogue of the *Crataegus* species of the world. I first used the Kew Index Catalogue as a basis, but now my catalogue represents the species as I have seen their descriptions in the original literature. This was a tremendous task and I have had to visit all of the great botanical libraries of the country to accomplish it, but the necessity for the work can be seen in the many new names added to the Kew list, and the numerous errors corrected.

This search has also given me a broad knowledge of the best literature of *Crataegus*. I am now expanding this work into a general study of Pomaceae and Prunaceae.

Another task which I set out to accomplish was to bring together the work of Beadle, Ashe and Sargent, who had been, in a general way, working entirely on independent lines. Beadle knew but few of Ashe's species; Ashe had but little more information in regard to Beadle's or Sargent's; while Sargent had only about one third of Beadle's species in his herbarium, and had made the statement that nearly one hundred species were indeterminable. This situation I have gradually cleared up, but still have many problems to settle, principally in regard to Ashe's species. My visit to Ashe's herbarium showed me, at once, that I should have to visit many of his southern type stations, for in some cases his material was incomplete, and then, again, I needed to see many of his southern species in the field to properly understand them.

My real critical study of the genus began in 1906, in the prep-

aration of the group for Britton and Shafer's Trees of North America. In this work I was handicapped by lack of southern and western material, for the only species I could take up were those represented in our herbarium, and therefore the work is lacking in southern and western species.

In 1907, I wrote up *Crataegus* for the new Gray's Manual. In this work I was still bothered by lack of knowledge of the southern and western forms; while Dr. Sargent has since published over two hundred species, from the northeastern range. I was aided, however, by easy access to the Arnold Arboretum herbarium, and I had an excellent opportunity to observe the many living forms then coming on in the Arboretum.

In November, 1907, I had my first trip South, visiting White Sulphur Springs, West Virginia; Biltmore, Fayetteville and Raleigh, North Carolina; and getting much valuable fruiting material. At this time I spent three days in Ashe's herbarium, and three months at Biltmore; and took North with me all of Beadle's species and most of Ashe's species which I did not already have.

In 1903 and 1904, Mr. C. L. Boynton, of the Biltmore Herbarium, made extensive trips in North Carolina, visiting Ashe's type stations; and he also covered a good deal of Kentucky, West Virginia and Virginia. Those explorations helped to settle some of our vexing problems and also made others.

In August, 1908, I started on another southern trip. Most of the species and groups of the South, except in the mountains, are different from the northern plants; and one problem to be settled was, How many of the southern species reach southern Virginia, West Virginia and Kentucky. Another problem was, How many of the northern species extend south in the mountains. This journey gave me much information along these lines.

I first stopped in southwest Virginia, visiting Finchley, Lawrenceville, Emporia and Franklin, along the southern border. This trip showed me that we cannot expect many of the southern species in Virginia. Of the great group *Flavae*, *C. flava* Aiton was the only one seen, and of the southern *Intricatae*, perhaps one species. I reached Fayetteville, North Carolina, in time to

be tied up by the great coastal plain flood, but while waiting there found *Crataegus flava* Aiton in good fruiting condition and was thus able to identify surely, for the first time in America, the plant described by Aiton from material in the Kew Gardens in 1789. Then I went to Ashe's stations at Bladenboro, Raleigh, King's Mountain, Charlotte, Salisbury, China Grove, and Catawba, North Carolina; stopped at Biltmore, and, finding *Crataegus* in extra fine condition there, made a complete collection of the species of the region. Then I visited Ashe's stations at Hot Springs, Paint Rock, and Marion, North Carolina, and, going over the mountains by the new Clinchfield R. R., stopped at Bristol, Virginia, and then at Mountain City, Tennessee. From Mountain City, Tennessee, I drove over forty miles across the Stone Mountains to Beaver Creek, Ashe County, North Carolina. This was the type region of several of Ashe's species and the most important region to look for northern forms. Mountain City, Tennessee, is at 2,500 feet elevation, the pass over Stone Mountain 3,500 feet, and Beaver Creek over 3,000 feet, while no part of Ashe County is lower than 2,500 feet.

I was very successful in my search here, getting *Crataegus amara* Ashe, the type of a southern group which I had not seen in Mr. Ashe's herbarium, and a number of northern species, including *C. rotundifolia* (Ehrh.) Borckh, which proved to be Ashe's *C. viminea*, a fact which I had suspected both from the description and from material collected by Boynton.

I next went to West Nashville and Lookout Mountain, Tennessee, type stations for both Beadle and Ashe. I then visited Rome, Georgia, where Dr. Chapman got *C. triflora* and *C. collina*, and Mr. Beadle got several of his types. Then I started north again, stopping at Salisbury, Chapel Hill, Southern Pines, Sanford, Fayetteville, and Kinston, North Carolina, and securing much valuable material and information.

In May, 1909, the Garden sent me to explore the Cumberland-Tennessee region in Western Kentucky. On my way down, I stopped at White Sulphur Springs, West Virginia, finding both *Crataegus* and *Malus* in fine flowering condition; then I went to Clifton Forge, Virginia, and secured *Crataegus Vailiae* Britton in

flower; Mr. C. L. Boynton had found it there before in fruit. Then I stopped at Biltmore and sent north all of the unnamed *Crataegus* in the Biltmore Herbarium. Nashville was next visited. I spent about four weeks in western Kentucky, securing some *Crataegus* and *Malus* material, and, on my way home, stayed a week at St. Louis, having a fine opportunity to see *Crataegus Margaretta* Ashe; but spending most of my time arranging and studying the *Crataegus* herbarium of the Missouri Botanical Garden.

In August I started on my longest trip South, stopping again at A. A. Heller's station, Franklin, Virginia, for *Crataegus flava*, and this time secured fruit and was certain of my determination.

My next stop was Fayetteville, North Carolina, and then a day at Hartsville, South Carolina. Elliot's Herbarium at the Charleston Museum was then visited and his *Crataegus* types studied.

From September 5 to 11, I was at Eutawville, S. C., in the vicinity of Thomas Walters' collecting ground. Four days were spent in the sand-hill region at Aiken, South Carolina and Augusta, Georgia, and one day at Waycross, Georgia.

Albany, Georgia, was the next stopping place, and, after that, Camilla, Georgia, where *Crataegus aestivalis* (Walt.) T. & G. is very common, and where I saw it for the first time in the field.

Two days were spent at Montgomery, Alabama, and two at Nashville, Tennessee. I next visited western Kentucky. Two weeks were occupied between Paducah and Kuttawa in making a general collection. A few interesting species of *Crataegus* were found and many oaks and hickories, while my collection of Compositae was very large. The same may be said of my Compositae collections at the other southern stations.

Mr. C. L. Boynton's trips in Kentucky and West Virginia had given us many interesting *Crataegus* specimens and, although it was now getting late in the season, I stopped at several of his stations. Leitchfield, Kentucky, is in the sandstone region; but in a limestone outcrop of a few acres, were one new species and two very rare ones of *Crataegus*, and at least two hybrid oaks. Salt Lick, Kentucky, was the next station visited, where several

species were seen different from any I had before found in Kentucky.

Another new species was then relocated at Gauley Bridge, West Virginia, and much interesting material secured at Thurmond, Hinton, and White Sulphur Springs.

I then stopped at Buchanan, Virginia, the type locality of *Crataegus Brownii* Britton. This was originally collected in flower and I wanted to see it in fruit, but was unsuccessful. Fortunately, Boynton found fruit of it here before this. However, I did find fruiting material of *Crataegus Vailiae* Britton, giving a third station for this species. The next day, Roanoke, Virginia, the type locality for *C. Vailiae*, was explored with no success; in fact, no *Crataegus* was seen here in fruit except *C. Crus-Galli* L.

From Roanoke I went back into the Piedmont region in North Carolina. Mr. Ashe had told me that the *Crataegi* of this region were seldom seen in fruit and this I had found true. However, this time I found *Crataegus Beadlei* Ashe in fine fruiting condition at Dunn's Mountain, Salisbury, and some interesting forms were seen at Albemarle, Stanley County, North Carolina. It was now the last week in October and the hard frosts had come, even to this southern country, so I started north.

On my way north I stopped at Philadelphia and rearranged the *Crataegus* herbarium of the Philadelphia Academy of Natural Sciences. I have now gone over all of the great *Crataegus* herbaria of this country. The next most important work will be the study of *Crataegus* types in foreign herbaria.

W. W. Eggleston.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton, director-in-chief, accompanied by Mrs. Britton and Mr. Percy Wilson, administrative assistant, sailed for Cuba on February 17, to continue the botanical exploration of that island. After landing, the party was joined by Professor F. S. Earle.

Syracuse University will begin next fall courses in forestry and

agriculture, leading to the establishment of a college of agriculture and forestry.

Columbia University is offering through the department of botany a course of extension lectures on agriculture and agricultural methods. This series is designed to serve as an introduction to the extensive additions planned by the department, leading, it is hoped, to the establishment of schools of forestry and agriculture.

At the Boston meeting of the American Association for the Advancement of Science and affiliated societies the following botanists were elected to the positions designated: Dr. D. T. MacDougal (Desert Botanical Laboratory, Tucson), president of the American Society of Naturalists; Dr. F. L. Stevens (North Carolina Agricultural College), president of the American Phytopathological Society; Professor D. P. Penhallow (McGill University), vice-president of Section G; Dr. Erwin F. Smith (Department of Agriculture, Washington), Professor L. R. Jones (University of Wisconsin), and Dr. G. T. Moore (Missouri Botanical Garden) were, respectively, elected as president, vice-president, and Secretary of the Botanical Society of America.

Meteorology for February. — The total precipitation for the month was 3.86 in. Maximum temperatures were recorded of 46° on the 2d, 42° on the 8th, 54° on the 16th, and 57.5° on the 27th. Also minimum temperatures were recorded of 2° on the 7th, and 12.5° on the 19th and 26th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

283 specimens of flowering plants and ferns from New Caledonia. (By exchange with the Museum of Natural History, Paris.)

15 specimens of flowering plants from Panama. (Collected by Dr. M. A. Howe.)

3 specimens of *Eriocaulon* from New Jersey and Maryland. (By exchange with the Philadelphia Academy of Natural Sciences.)

2 specimens of *Quercus* from Vermont. (Given by Professor F. S. Lee.)

1 specimen of *Quercus heterophylla* from Staten Island, New York. (Given by Dr. Arthur Hollick.)

1 specimen of *Cocos* from Chile. (Given by Dr. Robert E. Morris.)

25 specimens "Ustilagineen" fascicle X. (Distributed by Professors H. & P. Sydow.)

8 specimens of Hypocreales from Wisconsin. (Given by Professor R. A. Harper.)

2 specimens of slime moulds from Colorado. (Given by Professor E. Bethel.)

17 specimens of fungi from Iowa. (Given by Professor L. H. Pammel.)

35 specimens of rusts. (Given by Professor F. D. Kern.)

2,960 specimens from Andros, Bahamas. (Collected by Dr. J. K. Small and Mr. J. J. Carter.)

30 specimens of *Crataegus* from North America. (By exchange with the Missouri Botanical Garden.)

84 museum specimens from Panama. (Collected by Dr. M. A. Howe.)

2 specimens of *Crataegus*. (Given by Dr. H. H. Rusby.)

1 specimen of *Crataegus*. (Given by Professor M. E. Jones.)

5 specimens of *Crataegus* from New England. (Given by Professor F. L. Fernald.)

2 specimens of *Crataegus* from Colorado. (Given by Professor F. Ramaley.)

51 specimens for the local herbarium. (Given by Dr. Philip Dowell.)

70 specimens of flowering plants from Canada. (By exchange with the Geological Survey of Canada.)

75 specimens of mosses from West Virginia, Connecticut, Nebraska and Colorado. (Given by Professor John L. Sheldon.)

4 specimens of mosses from the Old World. (By exchange with Mr. Jules Cardot.)

20 specimens of mosses from France. (By exchange with Professor V. F. Brotherus.)

PLANTS AND SEEDS.

7 cactus plants from Mexico. (By exchange with National Museum, through Dr. J. N. Rose.)

32 plants from Andros, Bahamas. (Collected by Dr. J. K. Small.)

1 plant for conservatories. (By exchange with Mrs. Ernest Meière.)

8 orchids. (By exchange with Mr. J. A. Manda.)

1 orchid. (By exchange with Mr. C. J. Pauls.)

13 plants for conservatories, from Mexico. (Collected by Dr. W. A. Murrill.)

18 plants derived from seeds from various sources.

2 packets of palm seed, from Canal Zone, Panama. (Collected by Dr. M. A. Howe.)

1 packet of *Ageratum* seed from Havana, Cuba. (Collected by Dr. N. L. Britton.)

12 packets of *Crataegus* seed. (Collected by Mr. W. W. Eggleston.)

2 packets of seed from Colima, Mexico. (Collected by Dr. W. A. Murrill.)

1 packet of seed from Santo Domingo. (Collected by Mr. N. Taylor.)

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EDITOR

PERCY WILSON

Administrative Assistant

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JOURNAL

OF

The New York Botanical Garden

VOL. XI April, 1910. No. 124.

SPRING LECTURES, 1910.

Lectures will be delivered in the lecture-hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons at four o'clock, as follows:

April 30. "Spring Flowers," by Dr. N. L. BRITTON.

May 7. "Collecting in Southern Mexico," by Dr. W. A. MURRILL.

May 14. "The Origin and Formation of Coal," by Dr. ARTHUR HOLLICK.

May 21. "Water Lilies," by Mr. GEORGE V. NASH.

May 28. "An Expedition to the Panama Canal Zone," by Dr. M. A. HOWE.

June 4. "Summer Flowers," by Dr. N. L. BRITTON.

June 11. "The Rose and Its History," by Mr. GEORGE V. NASH.

June 18. "The Native Trees of the Hudson Valley," by Mr. NORMAN TAYLOR.

June 25. "The Extinct Flora of New York City and Vicinity," by Dr. ARTHUR HOLLICK.

July 2. "The Fungous Diseases of Shade-Trees," by Dr. W. A. MURRILL.

The lectures will be illustrated by lantern-slides and otherwise. They will close in time for auditors to take the 5:35 train from the Botanical Garden Station, arriving at Grand Central Station at 6:03 P. M.

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical

Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue.

Lectures will be continued during the summer. Announcements of the Summer Course will be made later.

REPORT ON BOTANICAL EXPLORATION IN ANDROS, BAHAMAS.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: According to plans for exploration in the botanically little known parts of Andros, Bahamas, approved by you, Mr. J. J. Carter and the writer left New York for the field on the tenth of last January. Proceeding by way of Miami, Florida, we got together our collecting outfit, which was stored in the Subtropical Laboratory, and reached Nassau, New Providence, in due time. We wish to thank Mr. Simmons, who is in charge of the Subtropical Laboratory and Garden at Miami, for placing the use of that institution at our disposal.

Nearly all matters of detail connected with the expedition at Nassau, had been arranged before our arrival, through the kindness and forethought of the Hon. Herbert A. Brook, Registrar of the colony. After consultation with Sir William Grey-Wilson, Governor of the Bahamas, and the Colonial Secretary, both of whom did all in their power to make our undertaking successful, we boarded our vessel, the *Nellie Leonora*, which was awaiting us in the harbor, and, weighing anchor towards sunset, we set sail for the government headquarters of the Mangrove Cay section of Andros. Our associate, designated by the governor as a member of the expedition, was Mr. James R. Aranha, of the Surveyor General's office of the colony. Mr. Aranha was an ideal companion, and his accurate knowledge of the topography of Andros and personal acquaintance with the native inhabitants, together with his tireless activity in the field, enabled us to accomplish our work both expeditiously and thoroughly.

Leaving Nassau harbor with a very light breeze, we rounded the western end of the island of New Providence about midnight. Gradually freshening and favorable winds on a southerly course increased our speed, so that sunrise found us off the reef opposite the settlement of Mangrove Cay. The run was relatively smooth and without noteworthy incident except for the sudden and unaccountable explosion of the binnacle lamp about two o'clock in the morning, which accident scattered burning oil about the cabin. The resulting flames, until extinguished by the quick

Fig. 16. Camp on the deck of a wrecked sailboat in a branch of Deep Creek.

action of members of the crew on watch, threatened a conflagration of serious proportions.

We anchored inside the reef between Golding Cay and the mouth of Lisbon Creek, and landed at once to call upon the commissioner of that district, Mr. L. E. Forsythe, whose intimate knowledge of Andros gained through his long residence there served much in directing our future movements.

Collecting was prosecuted here as far behind the marginal

ridge as it was possible to go on foot, and, in order to penetrate further inland, an expedition by small boat was made several miles up Lisbon Creek, where collections were made on some of the larger islands formed by the forking and intertwining of the creek branches. Having devoted as much time as was advisable to this section, we moved to the most southern base selected for exploration, namely Deep Creek. Having crossed the margin of the reef here, we found that we must anchor several miles from shore on account of the shallowness of the water on the reef. Consequently, we decided to stock a small boat with supplies and equipment and make camp inland several miles from the mouth of the creek. After establishing our camp on the deck of a wrecked sailboat that had been blown ashore during a recent hurricane, we proceeded to the headwaters of Deep Creek. Having finished collecting in the Deep Creek region, we returned to our schooner and started northward, making our way inside the reef, carefully avoiding shoals and submerged rocks, and came to an anchorage off Smith Hill, which is about four miles north of the mouth of Deep Creek. This was the first of a series of points selected as being the most advantageous bases from which to gain access to the interior.

Our collecting here and at subsequent stations was on lines approximately west from the shore to the water-shed of the island. Leaving Smith Hill, we sailed further north inside the reef for a distance of about six miles to the Crow Hill region and invaded that section by way of two little used trails that enter the back country several miles apart from each other. We had now worked up to near our first base on Mangrove Cay, consequently we started for Fresh Creek, attempting to sail inside the reef to Golding Cay. We were successful as far north as the channel that leads out to the ocean near Golding Cay; but there the combination of unfavorable winds and the narrowness of the channel defeated our attempt to pass out, and we were compelled to return to our anchorage opposite the Crow Hill region, and sail out to the ocean at that point at day-break the following morning.

At first, conditions appeared favorable for making rapid prog-

ress over our twenty-five mile course to Fresh Creek, but later in the day a series of light breezes and calms delayed our progress to such an extent that we were compelled to run in behind High Cay for a night's shelter just after dark, about six miles distant from our objective point. However, by an early start next morning, Fresh Creek was reached shortly after sunrise. Here Commissioner H. O. Wright, who sighted our boat while still outside the reef, came aboard with a local pilot, who took our vessel into the mouth of the creek at high tide, to an anchorage

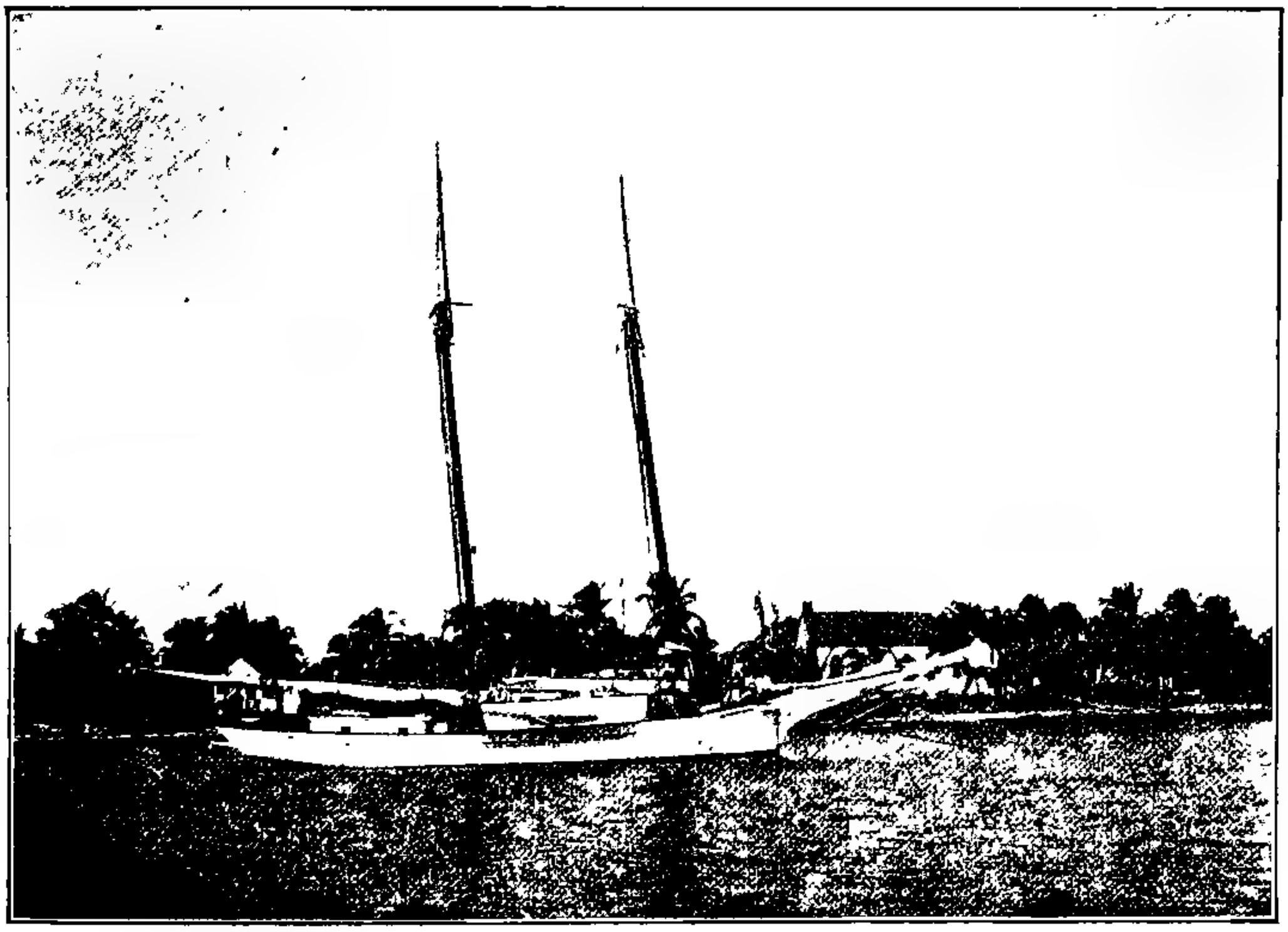

Fig. 17. The "Nellie Leonora" at anchor inside the mouth of Fresh Creek, opposite the settlement of Fresh Creek.

in the deep water behind the bar, thus giving us the only smooth and perfectly safe anchorage we had during the trip. One of the ship's boats was at once loaded with supplies and camp equipment, and we proceeded some fifteen miles up the creek to the water-shed, and made camp on a dry sand-bar about the middle of the island, in the vicinity of the fresh-water lagoons which exist in that region. After successful operations at this point, we returned to the vessel and sailed up the coast for about

nine miles and anchored off the mouth of Staniard Creek. While hunting for an anchorage, our schooner ran fast on a large sand-bar. The tide was then low, and, with no prospects of getting the boat off until the next high tide, we at once went ashore to collect and arrange for an excursion to the interior on the following day. Our next move was about eighteen miles northward through a very rough sea to Nicholl's Town, where we were hospitably received by Commissioner G. H. Clarke. We collected here in the regions to the south, west and north of the settlement.

Fig. 18. Camp on a sand-bar on the water-shed at the head of Fresh Creek. This region is interesting on account of its large fresh water lagoons. It is situated about the center of the largest island of the Andros group.

The topography of Andros is comparatively simple, and the highest altitude is probably less than one hundred feet, still there is sufficient diversity in the general make-up of the island to support six different plant formations. The coastal region represents the usual littoral flora of the tropics, which need not be considered further. Along the eastern edge of the island is

a lime-rock backbone of a single ridge or broken into several ridges. It extends nearly the length of the island, or a distance of about ninety miles. This backbone ends rather, or quite, abruptly with the shore on the eastern side. On the western side, however, the undulations, usually several in number, extend mostly one or two miles inland and gradually disappear in the flat country. Behind this rock ridge, there is a nearly level expanse extending to the western side of the island, which varies from about eight to forty miles in width. The rock backbone is broken south of the middle of the island by three transverse channels known as Northern, Middle, and Southern Bights. These bights make the four primary divisions of Andros. A second category of islands comprises the numerous small cays in the bights and on the barrier reef along the eastern shore, which varies from one to four miles in width. A third category contains those islands formed by the network of water-ways resulting from the almost innumerable branches of the eight or nine principal creeks which break through the rock ridge on the eastern shore and the numerous creeks of the western shore. The region made up of this third category of islands is called the "swash." The backbone of Andros is covered with a hard-wood forest called the "coppice." In the swash five distinct plant formations are represented, namely, "coppice," which exists here in isolated patches and is not continuous as it is on the rock ridge, the "scrub," the "pineyard," the "savannah" and the "marl."

The coppice consists of deciduous-leaved trees and shrubs. In it herbaceous vegetation is almost wanting or inconspicuous, except for the presence of orchids and bromeliads. The scrub consists of a dense growth of deciduous-leaved shrubs with scattered red cedars and palms. The pineyard occupies the flat, slightly elevated expanses of naked rock. Accompanying the pine trees are numerous shrubs and some herbs. The savannah exists on the higher land between the rock ridge and the marl, where soil of good quality covers the rock and makes possible a rather copious growth of grasses, sedges and other herbaceous vegetation. The marl is a series of vast, level, prairie-like tracts,

dry in the winter and more or less submerged in the summer. It consists of a rock foundation covered with a paste-like calcareous mud, which supports stunted shrubs and inconspicuous herbs.

The floral features of Andros are more interesting than its topography. Andros lies at the center of an ellipse which includes the main chain of the Bahamian archipelago, the middle portion of Cuba, and tropical Florida within its boundary. On

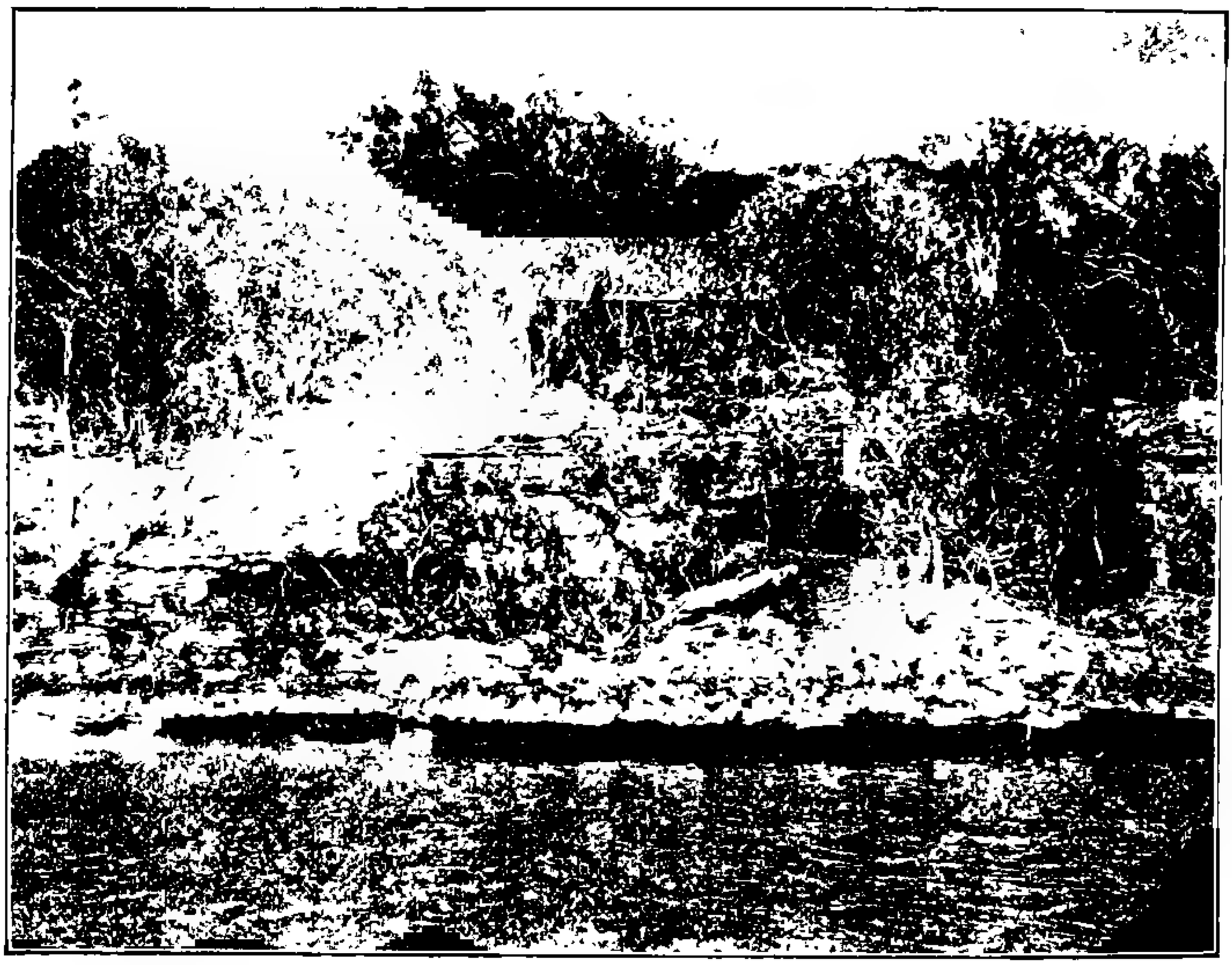

Fig. 19. Northern bank of Deep Creek, about one mile from the mouth. This shows a section through the rock backbone of Andros. The plant covering is "coppice"

the one hand, being thus surrounded, its flora partakes of many elements of the flora of these neighboring regions; and, on the other hand, in spite of having individual characters in its topography in addition to its relative large size and isolation, it apparently supports a very limited endemic flora.

Interesting revelations confronted us at each successive station as we advanced. Deep Creek was our southernmost base. This

stream is well named, and, if it were not for the bar at its mouth and the shallow water on the adjacent reef, it would afford an excellent anchorage for boats of all sizes used in that region. For several miles inland from the mouth, the banks are high, especially those on the north side, where they are usually precipitous, and, despite the absence of soil, they harbor a luxuriant growth of the common coppice plants and the less frequent and at the same time striking species of nearly leafless euphorbiaceous plants and shrubby and arboreous cactuses. The epiphytic flora there is represented mainly by species of *Epidendrum* and *Vanilla*. Toward the head-waters of the creek, the pineyard and marl occupy the vast level stretches. In the former, between its scattered pine trees, are showy masses of ironweeds and shrubs of the myrtle, dogbane, trumpet-creeper, madder, and sunflower families, supporting vines of the wild yam and various morning-glories. The shallow limestone sinks in the pine woods furnish a few terrestrial orchids; while the surrounding marl, for the most part barren, is dotted with stunted mangroves and other saline bushes. The most interesting shrub here is *Bucida spinosa*, which, tall and erect in most localities, grows perfectly prostrate, the branches spreading radially on the ground. The most distant portions of the marl reached by us support three common Floridian herbs of the orchid and bladderwort families, namely *Limodorum Simpsonii*, *Pinguicula pumila* and *Utricularia subulata*.

At Smith Hill the rock ridge seems less rugged than farther down the coast. On its densely wooded slopes, we first met with small plants of *Ibidium lucayanum*, growing in deep humus, and *Oncidium variegatum* growing on the neighboring shrubs; however, both these plants are scarce. The marl at this point, and the fresh water lagoons to which we penetrated, yielded the same plants we encountered at the head-waters of Deep Creek. The Crow Hill region, which is situated between the ocean and the eastern end of South Bight, exhibited greater diversity in both the structure of the land and the vegetation than did the former locality. In addition to the rolling hills of the rock ridge, there are flat, desert-like expanses of rock with small and large lime-

stone sinks which support a great variety of herbaceous and woody plants. A number of ferns we had not before encountered were found here, and *Ibidium lucayanum* grew much larger and in

Fig. 20. *Cephalocereus bahamensis* in the "coppice" along Deep Creek. Older plants are much more copiously branched.

greater profusion, together with the larger-leaved and otherwise more conspicuous orchid, *Govenia utriculata*. Among the woody plants, *Ilex Krugiana* and *Vitis Munsoniana*, both natives of

Florida, were common in the coppice. At this point, on account of the relative narrowness of the land, the marl does not exist and the pineyard is insignificant.

Mangrove Cay is the smallest of the three larger islands of the Andros group. The marginal ridge is high, but narrow. Behind it we found the greatest development of the scrub met with in all our travels, and, besides the mostly common shrubs which compose it, this formation is not very interesting except for its several palms and the Bahamian red cedar. Lisbon Creek alone enabled us to go inland, as the swash comes close to the marginal ridge. The coppice adjacent to the creek seems to be the culminating point for the growth of several species of orchids, among them the epiphytic *Epidendrum gracile*, with its pliable leaves and very fragrant, large flowers, and the terrestrial *Pelexia setacea* and *Vanilla articulata*, the latter growing in such remarkably vigorous clumps that it almost strangled the supporting vegetation.

Fresh Creek is situated near the widest portion of the largest island of the group. Contrary to its name, it is exceedingly salt, and, like Deep Creek, it forms an excellent channel for many miles inland and can be entered and used as a harbor by sailboats of forty and fifty tons burden. Its banks, where it cuts through the rock ridge, are low, and the pineyard and marl begin to appear not very far from its mouth. We penetrated fully fifteen miles inland, to a series of fresh-water lagoons. In this region, vast stretches of marl are broken by long and narrow strips of pineyard and irregular patches of water, some of which are salt, some brackish, and others fresh. Vegetation generally is stunted, often conspicuously so. Trees are mostly reduced to shrubs; the pine trees, which in most places seem to be able to thrive and grow straight in most unfavorable situations, here grow with their trunks curved and bent into all conceivable shapes. The most interesting herbs collected were *Physurus querceticola* and *Utricularia cornuta*, of Florida. Although not very abundant, at least at this time of the year, the latter plant was found here and there over a large area.

Inland from the mouth of Staniard Creek we found conditions

quite different from those existing at any of the other points visited. After passing over the densely wooded marginal ridge, upon which epiphytic and terrestrial orchids, such as *Epidendrum nocturnum*, *Epidendrum plicatum*, *Broughtonia domingensis* and *Oncidium sphacelatum* grow in astonishing luxuriance, we passed through a region of high pineyard with many small and large limestone sinks varying in depth from twenty to thirty feet. The sides of these sink-holes are covered with species of ferns we had not before encountered. There are many interesting plants in the pine woods, and also several small coppices with

Fig. 21. A view in the interior of Andros, near the headwaters of Fresh Creek. The "marl" is shown in the foreground, and narrow strips of "pineyard" appear in the distance.

their characteristic species, one of these being *Canavalia bahamensis*, whose greatly elongate stems and branches rival a hemp rope of equal diameter in strength. Farther back, the pine woods become less dense and give way to small savannahs surrounding beautiful fresh water lakes. These lakes are distributed in a chain running toward the southwest and probably connecting with the fresh water lagoons we encountered at the head-waters of Fresh Creek. Here *Zamia pumila* and *Aletris bracteata* appear

in the grassy savannahs, *Smilax Beyrichii* and *Smilax laurifolia* form tangles in the adjacent bushes, *Ilex Cassine* bears flowers and fruits at the same time, and the poison ivy of that region, *Rhus Blodgettii*, grows just as it does in Florida.

At Nicholl's Town there is considerable coppice to the south, west and north of the settlement, and beyond this to the west is pineyard and savannah. As this region of Andros was the best known botanically, we did not devote much time to it; but

Fig. 22. A fresh-water lake in the savannah region west of Staniard Creek, northern portion of Andros.

during a rapid survey, we brought to light *Vanilla Eggersii*, an orchid originally from Cuba, and *Limnanthemum aureum*, a Bahamian plant, but known before only from Great Exuma.

Andros is said to comprise fully one third the land area of the Bahamas. Approximately one thousand species of flowering plants are definitely known to occur on the islands of the Bahamian archipelago. Of this number, about five hundred and fifty, or over fifty per cent. of the Bahamian flowering plants, grow

naturally on Andros. An exceptionally large percentage of the plants are native, mainly because such a small area of the island is inhabited and cultivated. Less than half a dozen species are endemic.

A glance at a map of Florida and Andros will show the striking resemblance of Andros to southern peninsular Florida. The resemblance not only exists in the outline of Andros, but we have there the rock backbone corresponding to the east coast of Florida and the marl and inland waterways and lagoons corresponding to the everglade region. The comparison may be carried further, for, on the eastern coast, is the deep tongue of the ocean in place of the Gulf Stream and on the western coast lies the shallow Bahama Bank in place of the Bay of Florida and the adjacent Gulf of Mexico. This much for the geography; topographically, the rock ridge of Andros and adjacent pinebelt correspond to the Everglade Keys of Florida, while the marl and the savannahs with their patches and narrow strips of pine-land represent the Everglades themselves. In fact, we were in many situations, where the surroundings were so strikingly similar to those we were accustomed to in Florida that a second thought was often necessary in order to definitely locate ourselves. After tabulating the species of flowering plants known to occur in southern peninsular Florida and Andros, we find about three hundred and fifty species out of the five hundred and fifty growing on Andros, common to both places. Leaving out of consideration the host of strictly Floridian plants common to the two regions just mentioned, and also those that occur in both Andros and the coastal plain of the United States, it may be interesting to note a small group of species that seem perfectly at home in both the temperate Allegheny Mountains and tropical Andros. Among these are the cat-tail, *Typha angustifolia*, the pond-weed, *Potamogeton heterophyllus*, the green-briar, *Smilax laurifolia*, the smart-weed, *Persicaria punctata*, the Virginia creeper, *Parthenocissus quinquefolia*, the dodder, *Cuscuta Gronovii*, the fleabane, *Leptilon canadense*, and the fire-weed, *Erechthites hieracifolia*.

Having explored the territory as planned, except as local conditions made changes necessary, we returned to New York about

the middle of February with three thousand herbarium specimens, some museum specimens, and many notes on observations made in the field.

Respectfully submitted,

J. K. SMALL,

Head Curator of the Museums.

CONFERENCE NOTES.

The regular conference of the scientific staff and students of the Garden was held in the library on March 2. Mr. R. C. Benedict first discussed the Relationships of the Genera of the Vittarieae.

According to the law of biogenesis or recapitulation, the stages of growth through which an organism passes in reaching maturity repeat, *i. e.*, recapitulate, stages through which its type has passed in the course of its evolution. Considerable use is made of this law in conchology, where it is often possible in a single individual to trace all the growth stages of a single shell type. In plants, as for example in the study of the development of a given leaf type, it is necessary to take individual leaves from the earliest onward, but it seems probable that, with this difference, the law may be used equally well in the vegetable kingdom and the fern tribe, Vittarieae, seem to furnish a good example to illustrate it.

The Vittarieae are a tribe of tropical ferns of the family Polypodiaceae which includes most of our common species. One species grows in Florida, *V. lineata* (L.) Sw., there known as old man's beard. It usually grows on palmettos, often forming a beard-like clump, the leaves being long and very narrow, only a few lines wide, and hanging down in a very good imitation of a beard. The venation of this species and of all Vittarias is very simple and consists merely of a single vein through the middle, giving off lateral veins at intervals. These run to the margin, then bend forward parallel to the midvein, and each one joins the one above it, making a single series of closed spaces or areas, technically *areolae* (*i. e.*, little areas) along each side of the midvein.

The first leaves of *V. lineata* as shown by studies of Mrs. Britton and Miss Taylor, and of *V. remota* Fée which I have studied, are very simple, and the venation consists of a single vein extending through the middle. This is exactly the type of venation of a species of *Monogramme, M. trichoidea*, a Philippine species, which may well be considered as the simplest living fern. The leaves of this fern are but one or two inches long and scarcely thicker than a thread. After this first stage in the *Vittaria* leaf, the next few leaves show successively one or two to several areolae, arranged as in the mature leaves, but the leaves are broader in proportion, and sometimes actually broader than the later leaves. This stage corresponds to a species described as *Antrophyum minimum* Baker, but which I have put with two other species of about the same size and habit in the genus *Hecistopteris* J. Smith. There may be some question whether Baker's species belongs in this genus, but at any rate, it may be said that *Vittaria* passes through stages corresponding to *Monogramme trichoidea* and *Hecistopteris minima*, recapitulating in its growth the venation characters of these genera.

Similarly *Antrophyum* and *Ananthacorus* which have the most complex venation of all the genera in the tribe also recapitulate the characters of *Monogramme* and *Hecistopteris minima*. They differ from *Vittaria* when mature in having several to many rows of areolae along each side of the midvein instead of one, and they reach this condition merely by adding secondary areolae outside of those first formed in the *Hecistopteris minima* stage. Thus in *Antrophyum* and *Ananthacorus*, the two axial rows of areolae correspond exactly (*i. e.*, are homologous) with the only two rows developed in *Vittaria*.

The particular interest attaching to this line of study, lies in the possibilities which it offers in the way of clearing up some of the relationships and the generic limits of such fern genera as *Phlebodium*, *Goniophlebium* and others which have complicated reticulate venation and which are known to be related, but about which there is much difference of opinion. It should also be of value in connection with the study of seed plants.

Mr. B. O. Dodge gave a synopsis of his work on the fungi of

Wisconsin. Six hundred species were collected in Kewaunee county in the Green Bay Peninsula. Most of the inhabitants, expecially Bohemians and French, were familiar with a number of the edible varieties. The honey-mushroom, *Armillaria mellea*, the butter-mushroom as they call it, *Boletus Clintonianus*, and the copper-mushroom, *Boletus versipellis*, are among those most commonly collected for food.

Water color reproductions and photographs of some exceptional forms were shown. One of the rat-tail fungus (*Collybia radicata*) which was twenty-five inches high, a jelly-cup (*Acetabula vulgaris*) six inches broad, and the brain-fungus (*Naemotelia encephala*) three inches across. This last is remarkably brain-like in both internal and external appearance.

Several rare species were reported; one of the earth stars (*Geaster pectinatus*) was collected from two localities. This species is easily identified by the striations at the base of the puff-ball portion and by its slender stipe. The bone-fungus (*Polyporus osseus*) the occurrence of which in America has always been doubtful was also found during two seasons. It is one of the white, somewhat imbricated forms which, while watery and soft when fresh, becomes extremely hard and bony when dry.

The only specimen of *Scutiger subradicata* Murrill reported since the type specimen was described, differed from it only in having a longer and more slender stem.

Water color paintings of two cup fungi (*Pseudoplectania melaena* and *Detonia fulgens*) had been painted to complete a group without knowing that they both were very rare in America.

Two species of wood staining fungi (*Chlorōsplenium*) were discussed. Specimens of what was undoubtedly *Chlorosplenium versiforme* had been collected on several ash logs which had portions of the wood stained blue-green. The wood immediately beneath the fungus was usually uncolored. It does not seem probable that in the five logs examined the wood had been first stained by the other species (*Chlorosplenium aeruginosum*) and the stained wood later covered with fruit of *Chlorosplenium versiforme*. It would seem from his observations that both species stain the wood.

A table showing the geographical distribution through the United States of the species collected showed that the fungous flora of the Wisconsin region probably does not differ materially from that of any other region. Where species had not been reported in other state lists it was evident that it might be a species not easily recognized or that the region had not yet been thoroughly worked.

FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. Ezra Brainerd, of Middlebury, Vermont, recently spent a day at the Garden herbarium. Dr. Brainerd was on his way south to study violets in the field for about two months.

The second instalment of the George Massee fungus herbarium which arrived here in January is being incorporated in the permanent collections. This addition consists of about twenty-five hundred specimens of Discomycetes which are of great value in connection with work on "North American Flora."

Dr. and Mrs. N. L. Britton and Mr. Percy Wilson returned from Cuba, April 6. A large amount of herbarium material, specimens of living plants and many valuable notes on geographic distribution were secured. A report of this expedition will appear in the May JOURNAL.

Number 24, Vol. VII., of the Bulletin of the New York Botanical Garden, containing the annual report of the Director-in-Chief and other official documents, was issued March 17, 1910.

Dr. J. A. Shafer returned to the Garden, April 5, having spent six months in botanical exploration in northeastern Cuba. He visited the principal keys bordering the north coast westwardly of Nuevites Bay, explored the pine-covered plateau of the Sierra Nipe, and made several excursions into the little-known mountain regions west of Baracoa.

Mr. Wilmer G. Stover, of Miami University, Oxford, Ohio, spent several weeks at the Garden during March and April, preparing a key to the gill-fungi of Ohio.

Professor F. D. Heald, of the University of Texas, visited the

Garden March 12, to examine certain species of the genus *Cercospora*, many of which are harmful to cultivated plants.

Dr. Gertrude S. Burlingham was at the Garden during the Easter vacation, studying the genus *Russula* for publication in "North American Flora." Her monograph on *Lactaria*, a closely related genus, has recently appeared in this work.

Mr. J. F. Cowell, director of the Buffalo Botanic Garden, and Mr. L. B. Judson, from the College of Agriculture, Ithaca, N. Y., visited the Garden on March 18. They spent several hours in inspecting the collections at the two conservatory ranges and at the propagating houses.

Meteorology for March.—The total precipitation for the month was 1.04 inches. Maximum temperatures were recorded of 54.5° on the 13th, 65° on the 20th, 81.5° on the 25th, and 85.5° on the 29th. Also minimum temperatures were recorded of 22.5° on the 11th, 17° on the 18th and 32° on the 22d.

ACCESSIONS.

LIBRARY ACCESSIONS, JANUARY 1 TO MARCH 31, 1910.

BERGER, ALWIN. *Stapelieen und Kleinien einschliesslich einiger anderer verwandter Sukkulenten.* Stuttgart, 1910. (Given by the Author.)

BRIDGEMAN, THOMAS. *The florist's guide.* Ed. 2. New York, 1836. (Given by Dr. J. H. Barnhart.)

BRIDGEMAN, THOMAS. *The fruit cultivator's manual.* New York, 1844. (Given by Dr. J. H. Barnhart.)

BRIDGEMAN, THOMAS. *The young gardener's assistant.* New edition. New York, 1862. (Given by Dr. J. H. Barnhart.)

CANNON, WILLIAM AUSTIN. *Studies in heredity as illustrated by the trichomes of species and hybrids of Juglans, Oenothera, Papaver, and Solanum.* Washington, 1909. (Given by Dr. D. T. MacDougal.)

Carnegie Institution of Washington. Year Book 6 & 7. Washington, 1908–09. 2 vols. (Given by Dr. D. T. MacDougal.)

COBBETT, WILLIAM. *American gardener.* London, 1821. (Given by Dr. J. H. Barnhart.)

CONRAD, HENRY SHOEMAKER & HUS, HENRI THEODORE ANTOINE. *Waterlilies and how to grow them.* New York, 1907. (Given by Mr. G. V. Nash.)

COULTER, JOHN MERLE & NELSON, AVEN. *New manual of botany of the Central Rocky Mountains.* New York, 1909. (Given by Dr. N. L. Britton.)

DOYLE, MARTIN. *The flower garden.* New York, 1835. (Given by Dr. J. H. Barnhart.)

GERSTE, A. *Notes sur la médecine et la botanique des anciens Mexicains.* Rome, 1909. (Deposited by the Trustees of Columbia University.)

GOODRICH, CHAUNCEY. *The northern fruit culturist.* Burlington, 1849. (Given by Dr. J. H. Barnhart.)

GREEN, JOSEPH REYNOLDS. *History of botany 1860–1900.* Oxford, 1909.

HORNADAY, WILLIAM TEMPLE. *Camp-fires on desert and lava.* New York, 1909. (Given by Dr. N. L. Britton.)

JEPSON, WILLIS LINN. *The trees of California.* San Francisco, 1909. (Given by Dr. J. H. Barnhart.)

JUNK, WILHELM. *Bibliographia Linnaeana.* Berlin, 1902. (Deposited by the Trustees of Columbia University.)

KELLOGG, JAMES LAWRENCE. *Shell-fish industries.* New York, 1910. (Given by Dr. N. L. Britton.)

KLEBAHN, HENRICH. *Krankheiten des Flieders.* Berlin, 1909.

LAMBERT, ANDRÉ & STAHL, EDUARD. *Die Gartenarchitektur.* Ed. 2. Leipzig, 1910.

LIVINGSTON, BURTON EDWARD. *The relation of desert plants to soil moisture and to evaporation.* Washington, 1906. (Given by Dr. D. T. MacDougal.)

LLOYD, FRANCIS ERNEST. *The physiology of stomata.* Washington, 1908. (Given by Dr. D. T. MacDougal.)

MOBIUS, MARTIN. *Botanisch-mikroskopisches Praktikum für Anfänger.* Ed. 2. Berlin, 1909.

MOSCOSO, RAFAEL M. *Las familias vejetales representadas en la flora de Santo Domingo.* Santo Domingo, 1897. (Given by Mr. N. Taylor.)

PEARL, RAYMOND. *Variation and differentiation in Ceratophyllum.* Washington, 1907. (Given by Dr. D. T. MacDougal.)

RICCA, UBALDO. *Movimenti d'irritazione delle piante.* Milano, 1910. (Given by the Author.)

Report of the New York Meteorological Observatory of the Department of Parks, Central Park, New York City, for the year 1900–08. New York, 1900–08. 9 vols. (Given by Dr. Daniel Draper.)

SAYERS, EDWARD. *The American flower garden companion.* Boston, 1838. (Given by Dr. J. H. Barnhart.)

SAYERS, EDWARD. *The American fruit garden companion.* Ed. 2. Boston, 1839. (Given by Dr. J. H. Barnhart.)

SCHLEIDEN, MATTHIAS JAKOB. *Studien: populäre Vorträge.* Ed. 2. Leipzig, 1857.

SPALDING, VOLNEY MORGAN. *Distribution and movements of desert plants.* Washington, 1909. (Given by Dr. D. T. MacDougal.)

TRINIUS, CARL BERNHARD. *Phalaridea.* Petropoli, 1839. (Given by Dr. J. H. Barnhart.)

MUSEUM AND HERBARIUM.

8 specimens of mosses from Troy, Jamaica, W. I. (Collected by Mr. J. King Brown.)

18 specimens of *Crataegus* from the northeastern United States. (Given by Mr. E. P. Bicknell.)

1 specimen of *Crataegus* from Massachusetts. (Given by Mr. C. E. Faxon.)

22 specimens of mosses from Arizona. (By exchange with Professor J. C. Blumer.)

15 specimens of ferns from New York. (Given by Mr. W. R. Maxon.)

25 specimens "Lichenes Suecici Exsiccati," fascicle VII. (Distributed by Dr. G. O. A. Malme.)

280 specimens of West Indian plants, from the Alexander-Prior Hebarium. (By exchange with the Royal Gardens, Kew, England.)

20 specimens of *Sphagnum* from the United States. (By exchange with Mr. H. H. Bartlett.)

125 specimens of mosses from Cape Breton Island. (By exchange with Mr. George E. Nichols.)

15 miscellaneous specimens of *Fissidens*. (By exchange with the Royal Gardens, Kew, England.)

2 specimens of *Philonotis*. (By exchange with Mr. Gabriel Dismier.)

3 specimens of *Leucobryum*. (By exchange with the Royal Botanical Garden, Berlin, Germany.)

6 specimens of *Fissidens*. (By exchange with the Museum of Natural History, Paris, France.)

3 specimens of mosses from Michigan. (By exchange with Mr. H. H. Bartlett.)

2 specimens of fungi from Russia. (By exchange with the Bureau of Plant Industry, Washington, D. C.)

22 specimens of fungi from Java. (By exchange with Abbé G. Bresadola.)

1 specimen of a puft-ball from Jamaica, W. I. (Given by Mr. Wm. Harris.)

15 specimens of fungi from Vermont. (Given by Miss Gertrude Burlingham.)

27 specimens of fungi from Pocahontas County, West Virginia. (Given by Professor John L. Sheldon.)

2,500 specimens of fungi. (Being the residue of the fungus herbarium of Professor George Massee.)

50 specimens of gill-fungi from Ohio. (By exchange with Mr. Wilmer G. Stover.)

PLANTS AND SEEDS.

154 conifers and deciduous trees for hardy collection. (By exchange with New York Zoölogical Park.)

5 plants for conservatories (By exchange with Botanical Garden, Stuttgart, Germany.)

10 plants from Mexico. (Collected by Dr. H. H. Rusby.)

1 plant for conservatories. (By exchange with Botanical Garden, Budapest, Hungary.)

1 cactus from Jamaica. (By exchange with Hope Botanical Gardens.)

17 plants from Cuba. (Collected by Dr. J. A. Shafer.)

33 plants from Cuba. (Collected by Dr. N. L. Britton.)

11 bulbs for conservatories. (By exchange with Mr. E. S. Miller.)

180 packets of seed. (By exchange with Botanical Garden, Tabor, Bohemia.)

38 packets of seed. (By exchange with Botanical Garden, Leiden, Holland.)

1 packet of seed. (By exchange with Director of Agriculture, Jamaica.)

37 packets of seed. (By exchange with Botanical Garden, Stuttgart, Germany.)

1 packet of seed. (Given by Mr. G. E. Osterhout.)

101 packets of seed. (By exchange with Royal Botanical Garden, Glasnevin, Dublin.)

5 packets of seed. (By exchange with Botanical Garden, Groningen, Belgium.)

13 packets of seed. (By exchange with Botanical Garden, Darmstadt, Germany.)

84 packets of seed. (By exchange with Botanical Garden, Budapest, Hungary.)

5 packets of seed from Mexico. (Collected by Dr. H. H. Rusby.)

10 packets of seed from Costa Rica. (Given by Mr. H. Wercklé.)

22 packets of seed. (Purchased.)

27 packets of seed for hardy collection. (By exchange with Prof. W. J. Beal.)

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Vol. 22, part 1, issued May 22, 1905. Rosales: Podostemonaceae, Crassulaceae, Penthoraceae, Parnassiaceae.

Vol. 22, part 2, issued December 18, 1905. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Hamamelidaceae, Pterostemonaceae, Altingiaceae, Phyllonomaceae.

Vol. 7, part 1, issued Oct. 4, 1906. Ustilaginaceae, Tilletiaceae.

Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

Vol. 25, part 1, issued August 24, 1907. Geraniaceae, Oxalidaceae, Linaceae, Erythroxylaceae.

Vol. 9, parts 1 and 2, issued December 19, 1907, and March 12, 1908. Polyporaceae.

Vol. 22, part 3, issued June 12, 1908. Grossulariaceae, Platanaceae, Crossosomataceae, Connaraceae, Calycanthaceae, Rosaceae (pars).

Vol. 22, part 4, issued Nov. 20, 1908. Rosaceae (pars).

Vol. 17, part 1, issued June 30, 1909. Typhales—Poales.

Vol. 16, part 1, issued Nov. 6, 1909 Ophioglossales—Filicales.

Vol. 9, part 3, issued Feb. 3, 1910. Boletaceae, Chantereleae, and Lactarieae (pars).

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by Dr. Arthur Hollick and Dr. Edward Charles Jeffrey. viii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 pp., with 73 figures and 14 plates. 1908.

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. Five volumes.

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127. The Crataegi of Mexico and Central America, by W. W. Eggleston.
128. Studies on the Rocky Mountain Flora—XIX, by P. A. Rydberg.
129. Studies on the Rocky Mountain Flora—XX, by P. A. Rydberg.

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OF

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EDITOR

PERCY WILSON

Administrative Assistant

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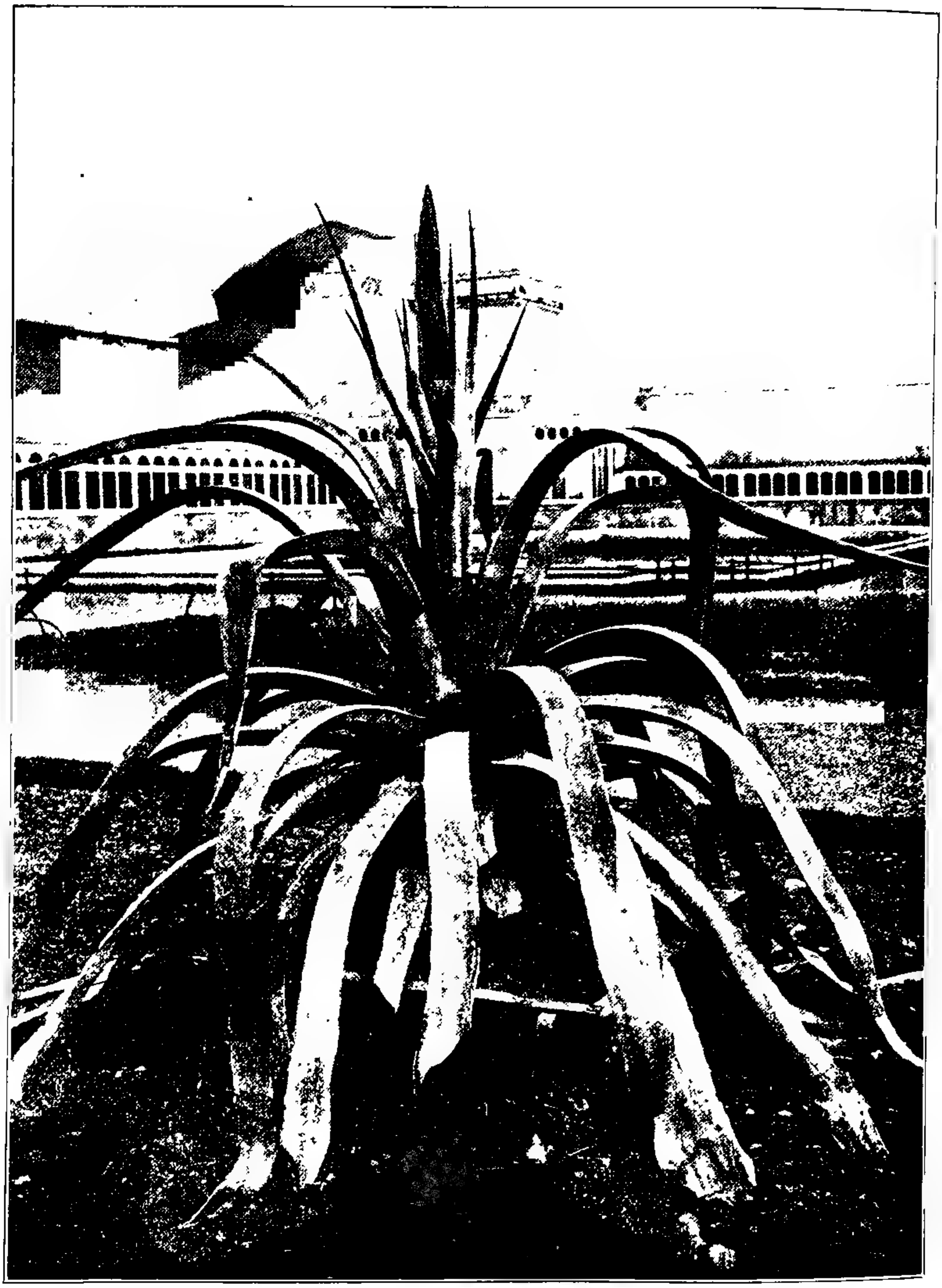

Agave americana IN THE COURT OF CONSERVATORY RANGE NO. 1.

JOURNAL

OF

The New York Botanical Garden

VOL. XI May, 1910. No. 125.

BOTANICAL EXPLORATION IN SANTA CLARA, CUBA.

TO THE SCIENTIFIC DIRECTORS.

Gentlemen: For the purpose of continuing botanical explorations in Cuba, and for increasing our collections of the plants of that island, as previously authorized by you, I was absent from the Garden from February 17 until April 6, 1910, accompanied by Mrs. Britton and by Mr. Percy Wilson, Administative Assistant.

We reached Havana on April 21 by the steamer "Morro Castle" and there met Mr. F. S. Earle, formerly a curator of the museums of the Garden, now an agricultural expert of the Cuban Sugar Refining Company, who had kindly made arrangements in advance for a trip through the Trinidad Mountains in the southern part of the Province of Santa Clara, a region botanically little known, and the examination of which was one of the principal objects of the expedition.

A day's delay being necessary in starting for Santa Clara Province, February 22 was given to a study of the coastal flora at the Playa de Marianao, a few miles west of Havana, where a number of interesting plants were collected, including a beautiful small palm (*Thrinax*) and very fine flowering specimens of the somewhat rare shrub *Colubrina cubensis*, of the Buckthorn Family.

We proceeded by rail to Cienfuegos, on the south coast, on February 23; this city is situated on a large and beautiful bay, some fifteen miles west of the western foothills of the Trinidad

Mountains. Here we had the pleasure of renewing our acquaintance with Dr. Emilio Cabada, and called on him at the beautiful family home, near the city, where he and his respected father have been much interested in the formation of a botanical garden. The following two days were occupied in outfitting for the mountain trip and by excursions to the mouth of the bay, for the purpose of studying the plants of the low hills which almost close the narrow entrance. We found the flora rich and varied, including a fine *Agave*, the occurrence of which had been indicated to me by Professor Trelease, and which grows there abundantly on an attractive little cay and on the mainland. Enough specimens were secured and shipped to supply our collections and those of the Missouri Botanical Garden. Here we also saw for the first time, a tree-like widely branching cactus up to twenty feet in height, its small flowers almost concealed in the excessively spiny ovary, which forms a soft egg-shaped bur in fruit; abundant specimens of this were also shipped, which will aid the cactus studies in progress in coöperation with Dr. J. N. Rose, of the United States National Museum. A climbing night-blooming cactus (*Selenicereus*) and a columnar woolly *Cephalocereus* were also collected. The little town of Castillo de Jagua proved to be so satisfactory a base that we determined to return here, after the mountain work had been accomplished, for the other main object of the expedition, the study of the vegetation of the southern coast of Santa Clara.

On February 26 we traveled to Hoyo de Manicaragua, about forty-nine kilometers eastward of Cienfuegos, part way by public motor-car, and part way by stage and there found ourselves just at the base of the northern foothills of the Trinidad Mountains. Here we enjoyed the kind hospitality of Mr. C. F. Koop, at his large tobacco estate; Mr. Earle had previously acquainted Mr. Koop with our objects, and he made it easy for us to carry them out by arranging for the necessary men, horses and mules, advising us as to routes and facilitating our work in many other ways; we are deeply grateful for his coöperation. Parts of three days were given to collecting in the hills of this vicinity, and on February 28 a start was made for the higher elevations, two

practicos, five horses and five mules forming the motive power of the outfit, a tent, a hammock and a sleeping bag, with camp equipment and provisions supplying the domestic needs. It is perhaps necessary to record that the mountain roads are impassable by wheeled vehicles.

The first camp (February 28, March 1) was pitched in a guava thicket near Guanabana at 260 meters altitude, and here we began to find, in the valleys, near streams, the characteristic plants of this mountain system; a few kinds of ferns were abundant, the manaca palm (*Calyptronoma*) was a fine feature in one ravine and specimens of many interesting trees and shrubs were collected. We are grateful to Señor Don Casimiro Barrios for thoughtful attentions.

On March 1 we moved on to the charming cascades of the Hanabanilla River (almost 320 meters altitude) and camped on a grassy ridge above these most attractive waterfalls; this river plunges here through a long, deep valley with very steep banks clothed with a great variety of plants. Specimens of more than one hundred different kinds were obtained during two days' collecting; a small-flowered *Agave* with bright green leaves was a prize worth coming for; ferns and mosses in great variety and abundance; many orchids and bromeliads on the trees and rocks; and wee flowering plants in the crevices of the rocky river bed together with the beauty of the cataracts make this spot one long to be remembered.

A guava thicket at Siguanea, altitude about 400 meters, was next occupied as a camp, March 2 to 4, and the wet ravines of that vicinity were visited, the most notable one being the Arroyo de Manaca at Herradura; ferns, mosses and a variety of woody plants being the chief features of interest. Here we were given assistance and information by Señor Don Amado Cardenas Monteagudo, Commandante of the *guardia rurale*, and this help is gratefully appreciated; Mr. Earle was obliged to leave us here on account of duties at the sugar plantations; advantage was taken of his return to Cienfuegos for the shipment of the living plants collected up to this time.

On March 5, at the invitation of Señor Don Manuel Hernandez,

we moved camp a few kilometers to the bank of a small stream at Los Cocos, with the special object of exploring the beautiful Arroyo Cimarrones, 470–500 meters elevation, under his personal guidance and were well repaid by the opportunity to collect many species not heretofore seen by us, including two pretty *Begonias*, a beautiful composite, and here we first met with tree-ferns on this trip, though not in the luxuriance and abundance in which they were later found at the higher elevations; mosses were found here in great quantities and the splendid red orchid *Stenorrhynchus speciosus* was a brilliant floral feature.

March 6 we traversed a nearly level stretch of country to the village of Rio Negro (450 meters elevation), passing along swampy woodland containing some interesting bog ferns and other plants, with a luxuriant growth of the manaca palm, and made camp in an unused tobacco shed, where the tent was pitched and the hammock swung. From here a few hours' tramp brought us into another wet valley, the Arroyo Trinitario, where some sixty different species of moisture-loving plants were collected, ferns and mosses being abundant again and varied. It is to be recorded that the hills and hillsides at elevations up to 600 or 700 meters through the region thus far traversed were at this time of year disappointing botanically, being very dry, and although quite heavily wooded, very few plants could be found in flower or in fruit; there had been no rain for several months; after the spring rains, we were told, the hillsides burst into bloom.

Camp no. 7 was made on March 8 under a large wild fig tree near a stream at Mananteales (about 450 meters altitude) but no very good collecting ground was found in the vicinity, dry hills and pastures surrounding it. Here we had opportunity of viewing an important Cuban industry, the raising of fighting cocks, one establishment having some one hundred and fifty of these birds, carefully labelled and variously priced up to high figures, and learned that the region was famed far and wide for the excellence of this product, which had the curious result of making eggs high-priced and difficult to obtain for culinary purposes, because they might be hatched out and yield cocks of great value! So the next day, March 9, we moved on and up to

El Porvenir (650–750 meters elevation) and camped in a coffee plantation along a brook, and here a rocky ravine and several forested hillsides yielded specimens of over fifty species not met with at the lower elevations; several tree-ferns, additional to the one previously noted were present in abundance; we were especially pleased at securing specimens of these splendid plants, which will aid the study of this group by Mr. W. R. Maxon, in progress for "North American Flora." A number of the forest trees were here found in flower, notably the "pancho" (*Mayepaea*), a relative of the northern fringe tree, its showy white flowers with similar narrow petals.

The road from El Porvenir to Aguacate, traversed March 10, was full of interest in the vegetation of the woodlands, the high grassy slopes and steep hillsides, and the mountain scenery is superb. Here we found at about 800 meters altitude several kinds of plants which grow naturally at sea level in Florida, notably the bracken fern *Pteridium caudatum;* camp was made in a *Piper* thicket at 850 meters altitude and here as at other camps in these mountains, two blankets were needed at night and winter overcoats were comfortable even about the camp fire. We are indebted to Señor Castineyra for kind attention and useful information. Aguacate was the highest land reached during the trip, the barometer indicating about 950 meters on one hilltop. Some distance to the east the Peak of Potrerillo, the highest of this range, rises to the height of 3,459 feet (about 1,100 meters) according to the sailing chart, but it is not accessible from the road traveled by us.

Our last camp in the Trinidad Mountains was pitched in a *poma rosa* jungle at Arroyo Grande about 650 meters altitude; here we were on the southern side of the mountains and the vegetation began to show the effect of less rainfall than that of the northern slopes; a number of different species of plants were found, but relatively few of them in flower, drought having occurred in this region for five months; a fine little cycad (*Zamia*) and a silver-palm (*Coccothrinax*) were seen on a rocky hillside. On March 12 we traveled from Arroyo Grande, down the south slope, to the picturesque ancient city of Trinidad, mostly through

steep mountain pastures of little interest botanically, but the views of the deep blue Caribbean Sea were greatly enjoyed from the higher altitudes; we rode into Trinidad just as the cathedral clock struck eight and that we went to bed promptly goes without saying.

From Hoyo de Manicaragua to Trinidad, 850 separate collections of plants were made, and these specimens will partly represent the flora of this mountain range. It is possible that the Peak of Potrerillo, rising about 150 or 175 meters higher than we attained, supports some additional species; this is best reached from Trinidad and may well be made an object of another expedition at another time of year.

Trinidad is situated at the southern base of a series of limestone hills, a few kilometers from its port, Casilda. Parts of four days were occupied by a study of the flora of this region, the hills, the coastal plain and the valley of the Rio Toyaba being visited, and specimens of over one hundred species, mostly shrubs and low trees, were here obtained. Fine marine views are had from the watchtower hill "La Vigia" just back of the town and the narrow valley of the Toyaba, navigable for small craft for several kilometers is very attractive, the low hills being wooded quite to the water and their flora varied; the striking floral feature at the time of our visit was the purple *Ginoria*, its nearly leafless branches covered with a profusion of showy flowers resembling those of the crape-myrtle, each tree conspicuous in the landscape for a long distance. Our boatman called it "flor de samana santa" because it always blooms in Holy Week. Several kinds of mistletoes inhabit the trees, and the rather rare *Ravenia*, a shrub of the Rue Family was found on the rocky river bank.

The plains about Trinidad are infested by a spiny African shrub, *Dichrostachys nutans*, called "aroma" by the Cubans, of the Mimosa Family, growing three to five meters high and densely covering many square miles of land, formerly under cultivation, to the practical exclusion of all other vegetation; it is most difficult to eradicate and a weed of enormous vigor. It has also become established in other parts of Cuba; the plant is distributed by cattle, and is a serious menace to agriculture; no economical method of extermination is as yet apparent.

On March 16 we returned to Cienfuegos by the very comfortable little steamer "Josefita"; some collecting was accomplished near the city on the morning of the seventeenth, and in the afternoon we proceeded again to Castillo de Jagua at the mouth of Cienfuegos Bay, which was made the base of operations for eleven days. The picturesque little *pueblo* takes its name from a small and beautiful fortress built some two hundred years ago to command the narrow entrance, and the hotel is immediately alongside of this interesting relic of Spanish ascendancy. From March 18 to 22 collections were made along the coast, and near it, including a visit to the valley of the Rio Arimao, some ten kilometers to the east, a small sailboat proving a convenient means of transportation, and a satisfactory view was thus obtained of the coastal flora. The gigantic cactus *Cereus nudiflorus* is locally abundant and fine fruiting specimens were obtained, supplementing the flowering ones had last year from Guantanamo; two palms, one a *Copernicia* the other a *Coccothrinax*, grow plentifully at Punta Diablo and Punta Sabanilla on either side of the harbor entrance and at Punta Diablo another (*Thrinax*) occurs sparingly. Shrubs and small trees were found in great variety; the most striking floral feature was a bright scarlet-flowered tree of the genus *Erythrina*, blooming as many Cuban trees do before the season's leaves appear, and so conspicuous as to be detected from the boat while more than a kilometer off shore at Punta Colorado, east of the lighthouse. The trip up the Arimao brought us in about six kilometers, to fresh water, and here many aquatics were collected.

Mr. Earle joined the expedition again on March 23 and we at once started in a cat-boat with two *practicos* eastward along the coast to study the flora of the southern foothills of the Trinidad Mountains and the adjacent river valleys, touching at Guajimica Cove, and proceeding that night as far as Rio San Juan where we camped on a sand-bar for two days, about half-way between Cienfuegos and Trinidad. There is here a delightful little harbor between the coastal hills; the borders of extensive mangrove swamps yielded specimens of many species of interest, and a small ravine, in the foothills, where a little stream cascades through

the forest after rainfalls, yielded many others, including a showy purple-flowered tree of the Meadow-Beauty Family, and a delicate little tufted *Selaginella* growing in travertine. The coastal hills provided several trees and shrubs not seen further west, but the inland hills proved dry and uninteresting. Returning, we camped in a charcoal shed at Guajimica Cove on the night of March 25; here there is another fine little harbor, its eastern side a precipitous cliff in the coastal hills, where a red-flowered *Gesneria*, found sparingly at Rio San Juan, grows in great plenty and the mangrove-swamp margins furnished other plants not heretofore seen on this trip; Rio Gavelan, a navigable stream, was visited in the afternoon, and in the evening, the boatmen pronouncing the *viento bueno del norte*, we set sail for Castillo de Jagua and ran in under a six-knot breeze, well repaid botanically, and delighted with our cruising experiences on the south coast. Our reception by the country people, both in the mountains and along the coast was most cordial; help and hospitality were freely offered at every point and politeness is evidently a natural trait; there was no inquisitive observation, and as soon as our errand was learned, intelligent interest was at once evidenced; our recollections of these kindly people will be most pleasant.

The two main objects of our expedition having been accomplished, a third one was taken up, and a visit made to the city of Santa Clara where we proceeded by rail on the afternoon of March 28, for the purpose of studying the flora of the extensive palm-barren nearby and three days were given to this work. This botanically interesting tract of land occupies many square miles, characterized by the abundant growth of a *Copernicia* palm; of many kinds of low shrubs and trees, for the most part different species from those inhabitating either the mountains or the coast, and of many grasses and small plants along the water courses; the variety of plants growing here is evidenced by our securing specimens of one hundred and seventy different species during three days of continuous collecting; some of these are the same as those had in the similar barren near Camaguay last year, but many are different, and not seen by us before; a *Tecoma* shrub, of the Trumpet-creeper Family, with showy pink flowers was abundant and conspicuous.

We traveled to Havana on April 1, and spent the following day partly on the north coast at Cojimar, where interesting shrubs and cacti were found in the coastal thickets, including a prickly-ash (*Zanthoxylum*) especially desired by Mr. Wilson for his study of that group for "North American Flora," and partly in the palm-barren east of Guanabacoa, which, being extensively pasture-land, did not yield much of particular interest. We sailed from Havana, April 3, on steamer "Saratoga" and arrived at the Garden, April 6.

The collections of plants made during the trip embrace in all 1,771 field numbers, aggregating not fewer than 4,000 specimens. This satisfactory result is due to the perfect weather experienced throughout, to the help and coöperation of Mr. Earle, and to the fluent command of the Spanish language possessed by the *señora americana*, which aided us on land and sea.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

PRESERVATION OF WILD FLOWERS.*

The few haunts of natural beauty in and about our city are fast becoming destitute of those innocent little plants, which, by their simplicity and loveliness, add charm to those cherished spots. It has been observed that during the past ten years, a great number of wild flowers have disappeared, several species having been completely exterminated, among which are the arbutus and the mountain laurel.

It is needless to state that those desirous of preserving our public grounds, and all who are interested in botany, are greatly alarmed at these results. Means have been taken to prevent the destruction of our native plants. Societies have been formed for the purpose, but these can effect comparatively little without the help of the community.

*Awarded a second prize, April, 1909, from the Caroline and Olivia E. Stokes Fund for the Preservation of Native Plants.

Plant preservation is dependent mainly upon the power of self-protection among plants, and upon the attitude of people towards them. Plants are adapted naturally to their environment. Some of them have devices by means of which they are rendered undesirable both to animals that may wish to feed upon them, and to people who may want to pick them. The absence of beauty in some plants, as well as protective coloring, affords them shelter; while the more conspicuous are the ones which are destroyed. Others have a disagreeable odor, bitter taste, or poisonous properties; these act as a safeguard, and protect the plants from destruction by animals.

All plants, however, are not endowed with the power of defending themselves against unwelcome visitors. Most are, on the contrary, so attractive or so beautiful, that people long to pick them. This is the case with our wild flowers. Almost anybody who sees them is instantly seized with an impulse to tear them up, without considering that it is the life of a plant and its single aim in life that they may destroy. The aim of every plant is to reproduce as many of its own kind as possible. If certain species fail to do this, those species gradually disappear. People may say that picking a few flowers in a certain public park will do no harm, but it will. If everybody picks the same kinds in the same parks, those parks will lose their wild flowers. This is what we are trying to prevent. But most people do not know that picking flowers is the main cause of the extermination of certain species of native plants.

In order to carry out its aim, the flower must produce seeds, which, when scattered, fall to the ground and grow up into new plants. When the flower is in bloom, the work of developing seeds has just begun, and is not completed until the petals and any other attachments fall off, and the fruit of the flower is ripe. If flowers are gathered before the seeds are fully developed, every hope of reproduction on their part is destroyed, and all that they have already done toward it, is useless. The lives of so many plants have therefore been wasted.

Some people, when picking flowers, pull them up with their roots. This is very disastrous to the plants, especially to spring

flowers. These have large underground storehouses in their root-stocks, and without the roots, the plant is unable to perform its proper functions. Late blooming plants suffer less, for their vegetative work is nearly completed when they become attractive and subject to injury. If, however, they are torn up with their roots, the promise of the next year's growth is destroyed.

Shrubs and woody perennials, such as the dogwood, are harmed when branches containing buds are broken off, since many young branches are thereby prevented from growing.

It is therefore evident that one of the causes of the disappearance of flowers is picking. The trouble arises from the ignorance as to the extent of the damage done. When a number of children who live in crowded districts, leave them to spend a happy day in the fields, their first thought is to gather flowers which they do untiringly, never stopping till they have a plentiful bouquet. But by the time they get home, the flowers are all wilted, and the children get no satisfaction from them. Chaperons of a party of children should impress upon their charges the necessity of enjoying the beauty of the flower in its haunt, and of leaving them where they are. The children may be allowed to pick one or two flowers carefully without unearthing the roots.

There is also a lack of consideration on the part of older people. Many completely ignore the rights of other people to enjoy public property, and, when on private grounds, they forget that the owner may have taken great care to plant them; papers, boxes and broken glass are often left on the grass, which, apart from spoiling the effects of nature's beauty, may hinder the growth of many flowers by shutting out the necessary sunlight. Sometimes matches are carelessly dropped, which produce fires, harmful, in their way, in burning to the ground a great number of plants. All this, with just a little care on the part of the visitors to our parks, may be easily avoided.

We have seen how it is that so many of our native plants are disappearing. Many people will acknowledge the fact that they are decreasing very rapidly in number, but it matters little to them. They seem to think that if our wild flowers are gone, cultivated ones can take their place, and they see no reason why .

any particular efforts should be made to preserve our wild flowers.

Another reason for the destruction of numberless native plants is the constant improvement of our city by cultivating wild lands around it, clearing them, draining them, or building on them. This, of course, cannot be helped, as an increase in population demands the extension of city limits.

There is every reason that our native plants should be saved. Every city takes pride in having its own local flora, and ours will soon disappear if care is not taken. It is advisable, when certain species become scarce, to transplant them to other places where they may be kept without fear of injury; but some flowers like the arbutus do not bear transplanting, and it is very difficult to transplant others. We should, therefore, try especially to leave such flowers to grow and reproduce their kind. Then again, our wild flowers are so beautiful that it seems a pity to have them destroyed, when they should be increasing in number every day.

When we consider the struggle for existence which every plant undergoes, we are willing to save them if only through gratitude, human sympathy and kindness. Plants, as well as animals, have life. As far as scientists know, "Life is the impulse to exist with the power of development from assimilation." No scientist can define life. The basis of life is protoplasm, without which no living thing can exist. "Plants are manufactories from which life is gained by inert material. Chlorophyll is a modification of protoplasm, and leaves, under sunlight, manufacture that life-giving energy that we, as animals, eat and assimilate." It is therefore evident that plants came before animals, and that the latter are dependent upon plants for food. We should therefore be grateful to plants, which are a means for our very existence.

As regards our sympathy and kindness we have only to know what a plant endures in life, and our sympathy will cheerfully be given to it. A seed is a miniature plant. If a seed is left in the ground, and has the proper conditions for growth, which are warmth and moisture, it awakens from its dormant state, and becomes active in pushing forth root and stem.

The root gives the plant a firm hold in the ground. A certain zone is covered with minute root-hairs, which take in from the

soil mineral matter and moisture which are necessary to the plant for food. The stem develops leaves, and acts as an organ of transmission and communication between root and leaves, sending up to the leaves the raw materials gathered by the root-hairs. The leaves take in carbon dioxide through stomata, little air chambers on their under surface. A leaf has four functions: photosynthesis, or starch-making, respiration, or the giving off of oxygen, assimilation, or the formation of tissue from manufactured food, and transpiration, or the giving off of water in the form of vapor. All this work which the root, stem, and leaves do, and which cannot be done without food and sunlight, is essential to the life and growth of a plant; as a result of this work, these organs multiply and increase in size; no plant can live if any one of these organs should, for some reason, fail to carry out its mission. Besides this, the plant has yet to produce many flowers, which can, by a long and complex process, resulting in the change of the flower into fruit, develop a great number of seeds imbedded in the fruits. When this is done the work of the plant for that year is completed, and it remains with us and with nature to see that as many seeds as possible are scattered and planted.

This gives an idea of the amount of work which even our modest little wild flowers must perform, and it is our duty to allow them to do it, without hindering them in any way. A principle which botanists uphold and carry out is, "To love the flower and leave it on its stalk." It is to be regretted that more are not botanists, but a knowledge of plant life and of the struggles of a plant for existence is sufficient for the adoption of the same principle.

The way, then, to preserve plants is to encourage the study of nature. Children should know that plants are living things, which they must not destroy, and should learn to love them, not passionately, for that would lead to extensive picking, but truly.

High school students are very enthusiastic in their nature work, and, in their eagerness to get specimens for study, destroy many neighboring flowers. Destruction on the part of botany students may easily be prevented. Instructors can arrange to

buy certain kinds of flowers, at botanic gardens or nurseries, where they are raised in large quantities for the purpose. If not, it would be advisable to have a portion of the public gardens and city parks devoted to raising such plants as are needed for botanic instruction.

There are certain wild flowers, such as violets, dandelions, daisies, buttercups, goldenrods, asters, and black-eyed Susans, which may be picked without fear of their extermination. Violets are cleistogamous, that is, they are closed to cross-fertilization, but usually produce hidden flowers underground which fertilize themselves. The other flowers, most of which are composites, are so numerous that they are considered pests. It would therefore be a good plan to have students study the structure and characteristics of these flowers, so that the rarer ones, which are decreasing in number, may be saved. These are the orchid, the dogwood, the rose, the spring beauty, the columbine, the wild pink, the blood-root and the azalea. Cultivated flowers, native as well as foreign, may be substituted for these, which are too precious to be ruthlessly destroyed.

But it must not be thought that children and students are doing all the harm to our flowers. There are various other collectors of plants, cultural, commercial and scientific. Of the cultural collectors little can be said, but it remains with them to make use of those flowers which may be picked without injury. Those who collect flowers for commerical purposes should be farsighted enough to realize that, if they heedlessly gather the rarer plants, the time will come when they will be unable to profit by them. As to scientific collectors, they destroy many flowers in their experiments and researches, and although it is held that anything sacrificed to science is praiseworthy, still ruthless collecting is also bad.

The societies for plant preservation are active in circulating petitions to inform people of the conditions existing among plants and of their power to prevent wanton destruction of our little wild flowers. These societies are doing work along the same line as the Audubon Society, which did very much to protect birds from injury. But the problem before the wild flower protectors

is more difficult than was that of the members of the Audubon Society. The latter was able to give strong reasons for the preservation of birds. Birds have the same instinct in their sufferings as we have, and they demand our sympathy and protection. The great economic uses of birds were made clear to the public, and this helped toward the success of the workers.

But our wild flowers have no great economic uses, except that a few are employed in the manufacture of medicines, but this has, on a large scale, been done away with. To most of us, wild flowers are nothing more than things which were made to beautify the world, and cannot be saved through similar petitions as those which were made in behalf of birds.

The safest and the surest way to insure the protection of our wild flowers is through nature-study. When people realize how plants struggle through life, when they come to know plants more intimately, when they see how much more beautiful plants are in their natural abode than elsewhere, and when they learn to feel for plants and sympathize with them as they do with their companions and fellow-men, then petitions will no longer be needed, but the plants will be able to carry out their aim in life without any external difficulties, and they will have in people, mutual aid for their existence. Let us hope that our wild flowers will soon bloom, unmolested in their haunts.

ANTONIA SCHATZBERG.

WASHINGTON IRVING HIGH SCHOOL,
NEW YORK CITY.

A CENTURY PLANT COMING INTO FLOWER.

In house no. 6 of conservatory range no. 1, which is located but a short distance from the terminal of the elevated railroad, is the large collection of agaves or century plants. Here these plants may be found during the greater part of the time but about the middle of May they are transferred to the court of the conservatory, where they form a part of the collection of American desert plants which is one of the attractive features of the Garden. They remain out of doors until about the middle of September when they are again placed in the conservatory.

One of the most striking members of this collection of agaves is a large plant of the American century plant, *Agave americana*, which was presented to the Garden in 1901 by Mr. F. T. Holder. In its nine years at the Garden it has changed but little, presenting now about the appearance it did when first received. The leaves, as shown in the accompanying illustration, are long and arching, the larger ones measuring about six feet in length and four to five inches wide, with a thickness of three inches at the base, their thickest part. They are terminated with a stout spine about an inch long, and the margins are armed with short black teeth. At times the old decaying leaves have made the plant appear unsightly, and on several occasions, on this account, it was decided to remove it from the collections, but it was allowed to remain with the hope that it would bloom some day. This hope is now being realized, for late in April it was noticed that the center of the tuft of leaves was changing in appearance. A few days later the meaning of this changed appearance was evident, for the apex of a flowering stem emerged from the heart of the leaves. On April 28 the top of this stem was five feet seven inches above the tub in which the plant is growing. On May 12 its height was seven feet, five and a half inches, showing a growth of twenty-two and a half inches in two weeks, or an average of a little over one and a half inches per day. Some days this has grown but one half an inch, while on others its increase in height has been three inches, the differences being due largely to varying conditions of temperature and light.

This is the largest century plant which has ever bloomed at the Garden, although other smaller ones have done so. One of these was the Vera Cruz century plant, *Agave Vera-Cruz*, which was in blossom last summer; an account of this appeared in the JOURNAL for August of that year. Another was Queen Victoria's century plant, *Agave Victoriae-reginae*, which flowered in the summer of 1906, a description of this occurring in the JOURNAL for July of the same year.

The name "century plant" has been applied to these plants from the mistaken idea that they must be one hundred years old before blooming. This is evidently fallacious, for in a wild state

they flower at a much younger age than this, some of them perhaps before they are ten years old. Most of them die after their blooming period is over, many producing young shoots from the base which perpetuate the plant. In cultivation under glass, however, they mature much more slowly and require a longer time to arrive at their blooming period. The plant here described may be forty years old, or perhaps older. The vigor of its flowering stem at the present time would indicate that it may finally reach a height of twenty-five feet or more. Some time during the summer it will bear a large cluster of flowers at the summit.

Century plants are found in deserts or in other dry regions in tropical and subtropical America. They are most abundant in Mexico, with other species in Florida, Texas and the West Indies.

GEORGE V. NASH.

CONFERENCE NOTES.

At the regular conference held in the library, on April 2, Dr. W. A. Murrill, who presided over the meeting, exhibited a new colored chart from Sweden showing a large number of poisonous and edible mushrooms and commented on the various species illustrated as well as on the merits of the illustrations themselves.

Mr. Nash exhibited staminate flowers of *Leitneria floridana*, taken from plants derived from seed obtained in an exchange with the Missouri Botanical Garden. The plants have been growing in ordinary soil in the nursery, far removed from the influence of swampy conditions. The relationship of this plant, which forms the single genus of the family Leitneriaceae, is not clearly understood. By Engler and Prantl it is placed between Myricaceae and Salicaceae. It is remarkable for the exceeding lightness of its wood, which has a specific gravity of about 0.21, making it the lightest known wood in the United States and one of the lightest in the world. This interesting plant was discovered by Drummond, apparently in Texas. In 1847 Dr. Chapman found it along the shore in the vicinity of Apalachicola, Fla., and in October, 1892, it was discovered by Mr. B. F. Bush in the deep swamps along the St. Francis River is southeastern Missouri.

Dr. Arthur Hollick exhibited and commented upon two specimens recently brought to light in overhauling unnamed material in the paleobotanical collections, as follows:

A fossil fungus allied to *Polyporus*, from the Carboniferous of West Virginia, described and figured in *Mycologia* for March, 1910, under the name *Pseudopolyporus carbonicus* gen. et sp. nov., and a fossil alga, unusually well preserved and defined, from the Devonian of Delaware County, N. Y., which will be described as a new species under the genus *Thamnocladus*.

Mr. E. D. Clark delivered a paper on "The Changes Produced by the Heating of Soils and their Effects on the Growth of *Pyronema* and other Fungi." The following synopsis was prepared by Mr. Clark.

At a former conference we outlined the proposed investigation upon this subject and at this time we shall discuss the results we were able to obtain. *Pyronema* grows in nature only upon soil that has been burned over, but as far as we know, no one until Kosaroff, and he only recently, has attempted to explain this fact. He proved that this fungus can be readily cultivated upon heated soil in the laboratory, but not upon soil which has not been so treated. Furthermore, he claimed to have been able to render unheated soils favorable to *Pyronema* by washing the soil with water and in other ways. All of this led him to believe that in unheated soils there are substances present, toxic to *Pyronema*, which are destroyed by the heating. This explanation based upon the presence of toxic substances is in accord with some of the more recent theories which find in such toxic organic matter the cause of the lack of fertility shown by certain soils.

We tried to extract a soluble substance from unheated soils which would show toxic effects upon *Pyronema*, and tested these extracts under many different conditions, but we failed in every case. This led us to believe that possibly the cause of the luxuriant growth of this fungus on burned soils was not due to the destruction of toxic materials in the unheated soil, but rather to the setting free of certain food materials not available to the plant before the soils were heated. Pots of soil were heated to

180° C. for four hours and the soil leached with distilled water. To our great surprise these water extracts of heated soil were brown in color and had an odor of caramel. They proved to be such favorable media for *Pyronema* and other fungi that we were unable to preserve the solutions except by sealing the bottles at the temperature of boiling water. On the other hand, the extracts of unheated soil were colorless, practically odorless, and were never infected with fungi of any sort.

With these dark-colored extracts at our command, we made a great variety of tests. We found that these extracts were ideal culture media for *Pyronema*, *Fusarium*, *Penicillium*, etc., and that the addition of large quantities of such extracts to heated soils caused them to become *more* favorable to *Pyronema* growth than heated soils not treated in this way. All of this seemed to show that the heating of the soils had set free certain food materials capable of supporting the growth of the fungi. It should be noted, however, that all attempts to render unheated soil favorable to *Pyronema* by the addition of the extract of heated soil resulted in complete failure. The reason for this is not clear, but it may well be that the adsorptive and decolorizing effects of the finely divided soil are similar to those of bone-black. Some of the dark-colored extracts were distilled in the hope of separating the volatile and non-volatile substances into fractions with different properties. This attempt likewise failed, for *Pyronema* grew both in the colorless distillate and in the dark distillation residue, the growth being most abundant in the latter, since it was more concentrated. We heated some soil in a combustion-tube and caught the products of the dry distillation in water; the solution thus obtained was alkaline to litmus and had the very offensive odor of pyridine bases. The solution seemed neither to inhibit nor to stimulate the growth of *Pyronema*. From this experiment and others, it does not seem likely that the beneficial effects of heating the soil are due to the driving off of unfavorable substances, but to certain changes produced in the soil itself. The extracts of heated soil were acid to litmus, gave many tests for organic acids, responded to the tests for carbohydrates, and finally, showed a strong reducing action upon

Fehling solution. These extracts then, seemed to contain organic acids and substances of the nature of sugars, resulting possibly from the decomposition of the cellulose, etc., left in the soil by previous plant growths.

We undertook a closer chemical study of the extracts of heated and unheated soils from New York, Massachusetts and North Dakota. Parallel determinations were made of the total soluble matter, the organic matter, and the inorganic matter in soil extracts prepared in various ways. In general, we found that the extracts of heated soils contained from six to fifteen times as much soluble matter as did the same soil before heating and further, the organic matter seemed to be increased to a greater extent than was the inorganic matter. The increase of soluble materials seemed to bear some relation to the amount of organic matter in the soils. The extract of one sample of North Dakota soil contained one thousand parts per million of soluble matter before heating, but showed ten thousand eight hundred parts per million after heating. The facts already referred to, that upon standing, the heated soil gradually lost its properties favorable to the growth of *Pyronema* and also that unheated soil could not be made favorable, even by the additions of large amounts of heated-soil extracts, were studied quantitatively and it was proved that when unheated soil was saturated with heated-soil extracts and allowed to stand, the latter were reduced to the same colorless state with almost exactly the same chemical composition shown by extracts of unheated soils.

The ash of the different extracts was examined to determine the nature of the inorganic matter present. We found that the ash of heated- and unheated-soil extracts (from North Dakota soil) contained calcium, magnesium and potassium, largely in the form of sulphates, along with some iron, sodium, manganese, silica, etc. From the known stimulating effects of calcium, and to a less extent of magnesium, one might say that the inorganic substances of the various soil extracts, as well as the organic constituents, may play a part in the growth of *Pyronema* upon heated soils.

As this work was being prepared for publication we found that

a similar paper is about to be published dealing with the effects of steam heat on soils, and the results are similar to ours in every respect, although we used dry heat in all cases. This would indicate that either dry or steam heat produces very deep-seated changes in soils, and that the sterilization of soils has other effects equally as important for the growth of plants as is the destruction of bacteria and fungi. In the course of this work we have come upon many interesting facts and it is our intention to carry this investigation still further with special regard to the effects of heated-soil extracts upon the green plants; the fungus *Pyronema* having served us well as an indicator of the changes produced in soils by heat.

FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Mr. J. B. Norton, of the Bureau of Plant Industry, Washington, D. C., spent a day at the Garden last month studying the herbarium collection of *Asparagus*.

Dr. E. J. Durand, instructor in botany at Cornell University, has been appointed assistant professor of botany in the University of Missouri.

Professor G. F. Atkinson, of Cornell University, visited the Garden April 21, to consult some of the older mycological literature.

Dr. George G. Hedgcock, of the National Timber and Forest Disease Survey, spent ten days at the Garden in April, consulting the collection of timber-destroying fungi.

The chair of botany at the University of Vermont has been filled by Dr. George P. Burns, of the University of Michigan.

Dr. Perley Spaulding, of the Division of Forest Pathology at Washington, made the Garden a brief visit in April to examine the collection of plant rusts.

Mr. Frank Dunn Kern, associate botanist of the Agricultural Experiment Station at Lafayette, Indiana, has been appointed fellow in botany at Columbia University for the ensuing collegiate year.

Miss E. C. Field, scientific assistant in the Bureau of Plant Industry, Washington, D. C., was at the Garden nearly two weeks in April, consulting the collections of parasitic fungi.

Mr. Fred J. Seaver, director of the laboratories, spent two days at the U. S. Department of Agriculture, Washington, D. C., studying fungi in connection with his work for "North American Flora."

Dr. John Hendley Barnhart, librarian, accompanied by Mrs. Barnhart, sailed for Europe, April 30. Dr. Barnhart will represent the Garden at the International Botanical Congress to be held at Brussels, May 14–22. He has been commissioned to secure books for the Garden library.

Dr. Arthur Hollick, curator, and Mr. Norman Taylor, assistant curator, spent several days in New Jersey, exploring the region from Freehold to Farmingdale, with the special object of examining the flora of the marl belt and pine-barrens in that region. The flora was found to be about two weeks in advance of New York city.

A scientific expedition to Colombia is being organized at Neuchâtel, the leader being Dr. O. Fuhrman, professor of zoölogy at Neuchâtel University. Dr. Mayor will accompany the expedition and devote his attention mainly to the parasitic flora.

The regular force of museum aids has been temporarily increased in order to mount the large accumulation of herbarium specimens received several years ago. This material will be distributed as fast as it is prepared, and thus made available for study.

The water of the lakes north of the Museum Building late in April was observed to be clouded and murky and a microscopic examination of it showed it to be swarming with multitudes of minute diatoms of the genus *Navicula*. This spring the diatoms seem to have replaced in a large measure the usual luxuriant growth of *Mougeotia*, *Spirogyra*, and other filamentous green algae. The diatoms are of peculiar interest to microscopists on account of their symmetrical and elegant forms and the regular and beautiful markings in their enclosing membranes. These enclosing walls are permeated with silica or silicic acid and the hard glass-

like siliceous skeletons are very durable. Diatoms are often so numerous in both fresh and brackish waters that the flinty shells left on their death form large deposits. Extensive deposits of diatomaceous matter are found in sedimentary rocks of various geological ages, especially from the Tertiary onward. These diatomaceous earths are put to various economic uses, the principal being as ingredients of scouring compounds or polishing powders, as a matrix for absorbing the gum in the manufacture of rubber goods, and also, it is said, as a matrix or carrier in the making of dynamite. Two of the best-known quarries of diatomaceous earths in the United States are at Richmond, Virginia, and in Nevada.

The Horticultural Society of New York, in coöperation with the Garden, will hold its summer exhibition of plants and flowers in the Museum Building. The exhibition will open on Saturday afternoon, June 4th, at 2, and will close at 6, and will remain open on the following day, from 10 to 5. Premiums have been offered by the Garden, to be awarded through the Council of the Horticultural Society, for peonies, roses, flowering shrubs and trees, orchids, and irises and other hardy herbaceous plants. An invitation is extended to all to enter exhibits, whether members of the Horticultural Society or not.

Following the meeting of the Horticultural Society on Saturday afternoon, there will be a public lecture, in the lecture-hall at 4 o'clock, by Dr. N. L. Britton, on "Summer Flowers," illustrated with colored lantern-slides. At the close of the lecture, about 5 o'clock, opportunity will be provided for visiting the grounds of the Garden under guidance.

Meteorology for April.—The total precipitation recorded for the month was 4.39 inches. Maximum temperatures were recorded of 78.5° on the 5th, 80° on the 15th, and 79.5° on the 30th; also minimum temperatures were recorded of 35° on the 8th, 29.5° on the 13th and 35° on the 29th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

240 specimens for the local herbarium from eastern Pennsylvania and New Jersey. (By exchange with Mr. Harold W. Pretz.)

28 specimens "Fungi Dakotenses," fascicle 3. (Distributed by Dr. J. F. Brenkle.)

158 specimens of Mexican mosses. (Distributed by Mr. C. G. Pringle.)

1 specimen of *Sphaeralcea variabilis triphylla* from Arizona. (Given by Professor T. D. A. Cockerell.)

11 specimens of *Crataegus* from the northeastern United States. (By exchange with Dr. Karl M. Wiegand.)

1 specimen of *Crataegus* from New York. (By exchange with Professor C. H. Peck.)

1 specimen of *Crataegus* from Indiana. (Given by Professor J. C. Arthur.)

100 specimens, "Fungi Columbiani," Century 31. (Distributed by Mr. Elam Bartholomew.)

293 miscellaneous specimens from North America. (By exchange with the United States National Museum.)

50 specimens, "Lactariae of North America," fascicles 1 and 2. (Distributed by Miss Gertrude E. Burlingham.)

60 specimens of polypores from the western United States. (By exchange with the National Timber and Forest Disease Survey, through Dr. G. G. Hedgcock.)

1 photograph of *Polyporus* sp. from Wisconsin. (Given by Mr. B. O. Dodge.)

250 specimens from Nevada. (Distributed by Mr. A. A. Heller.)

40 specimens of agarics from Ohio. (By exchange with Mr. Wilmer G. Stover.)

1 museum specimen of "Shiitake" from Japan. (Given by Professor S. Kusano.)

2 specimens of *Fissidens*. (By exchange with the Royal Botanical Garden, Berlin, Germany.)

33 specimens of hepatics from Cape Breton Island, Nova Scotia. (By exchange with Mr. George E. Nichols.)

10 specimens of fungi from Caucasus. (By exchange with the Bureau of Plant Industry, Washington, D. C.)

1 specimen of *Lupinus* from Nevada. (By exchange with the University of Nevada.)

68 specimens of flowering plants from Canada. (By exchange with the Geological Survey of Canada.)

78 specimens of flowering plants from Vancouver Island. (By exchange with the Geological Survey of Canada.)

1 specimen of *Utricularia* from Cuba. (Given by Mr. F. S. Earle.)

79 specimens from Yukon. (By exchange with the Geological Survey of Canada.)

4,000 specimens from Cuba. (Collected by Dr. and Mrs. N. L. Britton, Mr. Percy Wilson and Mr. F. S. Earle.)

PLANTS AND SEEDS.

4 plants of *Romneya Coulteri*. (By exchange with Mr. L. S. Livingston.)

5 plants for herbaceous collections. (Given by Mr. Geo. Ehrle.)

2 plants from Cuba. (Collected by Dr. J. A. Shafer.)

1 plant of *Cytisus Laburnum*. (Given by Mr. James Wood.)

22 plants from Cuba. (Collected by Dr. N. L. Britton.)

1,478 hardy woody plants, mainly shrubs. (Purchased.)

6 plants, derived from seeds from various sources.

6 packets of seed. (By exchange with Botanical Garden, Portici, Naples, Italy.)

6 packets of seed. (By exchange with Mr. Carlus Reukart, Nice, France.)

1 packet of seed of *Rhipsalis Cassytha*, from Ceylon. (By exchange with Dr. J. C. Willis, Royal Botanic Gardens, Ceylon.)

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Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

Vol. 25, part 1, issued August 24, 1907. Geraniaceae, Oxalidaceae, Linaceae, Erythroxylaceae.

Vol. 9, parts 1 and 2, issued December 19, 1907, and March 12, 1908. Polyporaceae.

Vol. 22, part 3, issued June 12, 1908. Grossulariaceae, Platanaceae, Crossosomataceae, Connaraceae, Calycanthaceae, Rosaceae (pars).

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EDITOR

PERCY WILSON

Administrative Assistant

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SUMMER LECTURES, 1910.

Lectures will be delivered in the lecture-hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons at four o'clock, as follows:

July 9. "Botanical Features of the West Indian Islands," by Dr. N. L. Britton.

July 16. "Interesting Relations between Plants and Animals," by Mr. F. J. Seaver.

July 23. "The Forms of Flowers and their Meaning," by Dr. C. C. Curtis.

July 30. "By Canoe down the Yukon River, Alaska," by Dr. Arthur Hollick.

Aug. 6. "Edible Mushrooms," by Dr. W. A. Murrill.

Aug. 13. "Influences which Govern Local Distribution of Plants," by Mr. Norman Taylor.

Aug. 20. "Botanical Cruises among the Bahama Islands," by Dr. M. A. Howe.

Aug. 27. "Grasses and their Economic Importance," by Mr. George V. Nash.

Sept. 3. "Poisonous Mushrooms," by Dr. W. A. Murrill.

Sept. 10. "European Influences in the History of American Botany," by Dr. J. H. Barnhart.

The lectures will be illustrated by lantern-slides and otherwise. They will close in time for auditors to take the 5:35 train from the Botanical Garden Station, arriving at Grand Central Station at 6:03 P. M.

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue.

Lectures will be continued during the autumn.

THE PRESERVATION OF OUR NATIVE WILD FLOWERS.*

We are now awakening to the realization of the fact, that some of our most delicate and beautiful wild flowers are fast disappearing. This has led a number of people to interest themselves in a movement to prevent the complete extermination of many of our native plants, a movement which promises to secure excellent results. To prevent wasteful destruction of plant-life, a national society known as The Wild Flower Preservation Society of America has been organized, and has done much good by issuing appeals to the general public, to nature-study teachers, and to children, asking their support in this movement.

How flower picking may be stopped without restricting the pleasure and freedom of the nature-lover, is one of the important questions to be solved. This can be partly done by education —by teaching the public to love the flowers and by discouraging their wanton picking and destruction.

Years ago, people thought that flowers were only for attraction, and useful for decoration, or subjects for poetry and song; but about 1793, after Sprengel's interesting work, in which he deals with their function, color and scent, man began to realize their greater import. Even at this period of civilization, many have not yet realized their value.

What would spring be without flowers to adorn the woods and waysides? Imagine spring in its prime, when wild flowers adorn every spot, when trees and shrubs are plentiful, vieing with each

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*Awarded a second prize, competition of 1909, from the Caroline and Olivia Phelps Stokes Fund for the Preservation of Native Plants.

other in their natural beauty, and then imagine spring, with the sweet fragrance of the flowers lacking, the cool and refreshing woods and copses removed, and the fields for miles and miles exposed to the burning sun. The latter condition will surely be our inheritance, unless some measures are taken to prevent it.

To illustrate the tendency toward the extinction of some of our native species, let us consider the orchids of temperate climates. These beautiful flowers were previously very abundant and because of their attractiveness would have been able to accomplish pollination successfully, and thereby continue the reproduction of their kind; but by indiscriminate picking because of their beauty, their number has been greatly reduced, and when the flower-lover finds one, if he loves flowers as he should, he refuses to pluck it, lest he too aid in its extinction. There are many other wild flowers, such as the mayflower, which have become comparatively rare, because of their superior fragrance; these flowers are gathered wherever possible and sold at a low price.

Destruction by picking seems to be the penalty that man has put upon the flowers in return for the response of the flowers to the effects of all natural influences, whereby their beauty was first called into being. The picking of the most beautiful always leaves the least attractive to perpetuate their kind. If left to selection by nature, the more beautiful the flower, the better is the chance for cross pollination, and the continuance of its kind. Thus flowers have a tendency by natural selection to become more beautiful. When man picks the most beautiful flowers he can find, he therefore not only helps to eliminate the species, but is putting a premium on the development of the less beautiful. This principle carried out, would mean that the beautiful had paid the price for their beauty by becoming extinct, and that in the struggle for existence the less beautiful, or those in which color and scent had been lost, had proven to be the fittest to survive. Shall the survival of the fittest include those of beauty, or will man, untutored, determine that beauty is a factor to be eliminated, and aid against all nature, in the elimination of that beauty by satisfying an ignorant and perverted taste or greed?

As there are laws prohibiting the sale of certain game, shot in

the state, the intention being to prevent the extermination of game by pot-hunters and dealers, so there should be laws prohibiting the gathering for sale of our native wild flowers.

Another native flower, picked in large quantities because of its beauty is the wild rose:

"Hast thou named all the birds without a gun?
Loved the wood-rose and left it on its stalk?"
—Emerson.

After having braved its thorns and broken its tough branches and stem, the picker gets small benefit since the petals quickly fall off. A field which is animated by the presence of birds and flowers leaves behind a memory cherished for years. The entire public must be enlightened on this subject, or nature will soon lose much of her beautiful garb.

Steps have been taken in the encouragement of children for a love of nature, and nature-study is now taught in most elementary schools. The preserving of native wild flowers may be taught in a few instances in connection with nature-study, but as taught at present, the reverse of preservation is the rule. These amateur students become very enthusiastic in the line of specimen hunting, but this enthusiasm should be guided so that their interest would not lead to the destruction of the very things for which nature-study is intended to give them a deep love. Children probably love most to pick wild flowers, and as soon as they are taught not to destroy the flowers, the battle is partly won.

In the biological laboratory work of high schools, especially the high schools of towns and villages of rural districts, there are vast numbers of wild flowers collected for study because they are easily obtainable, and because the students rather enjoy going into the fields about their homes to gather specimens. This reason for destruction could be obviated by school authorities, who should arrange for the purchase of such supplies from botanical gardens or nurseries, where plants have been raised in large numbers for purposes of study.

The true beauty of nature should be in the heart of everyone. as soon as the flowers open. How fine it is to look upon a bright flower, when the winter is over and spring commences. The

trailing arbutus, another rare flower, brings joy to the hearts of many when they find it on the snow-covered ground. There are other flowers too, which open early, just after the last sign of winter. The interest in spring flowers does not require to be instilled in the hearts of the real nature-lover. It comes with the spring itself. Those to whom this mostly applies are the children. If the children love the flowers so much, why not have them consider them as living things?

Why cannot the fifteen thousand boys and girls in the various schools of our different boroughs become interested in the general movement for the protection of our native plants? This vast army of workers could be secured with the aid of a few really interested persons. Series of lectures should be delivered to these children, especially because there are among them some amateur botanists who hunt after rare specimens and press them, often to be later discarded. Appeals should be made for their aid in this work. Societies should be formed among them, and the many who cause destruction of large numbers for specimen purposes, would probably abstain from it. These societies in the nature-study classes should be governed by local societies, who should have jurisdiction over the vicinity. The local societies should be directed by persons especially fitted for this kind of work. The plants needing protection in the immediate vicinity should be noted and protected.

The local societies are needed because the national nature societies can only study the general situation on a wide scope, while the local societies or branches can take care of the immediate needs of their own localities. As the Society for the Prevention of Tuberculosis has made a grand campaign in the home, school and elsewhere, and has in connection with its excellent work published considerable literature, so there is great need for the distribution of educational literature, especially to the classes of nature-study in the public schools, in order to arouse them to the importance of the necessity for the preservation of our wild flowers.

Charts and descriptive pictures should be liberally supplied to the nature-study classes, so that the destruction of material

for demonstration would be reduced to a minimum, thereby saving thousands of beautiful flowers which would have been used as specimens.

The suggestion of additional appropriation for the use of botany classes in many cities would probably have a beneficial effect, and would allow the purchase of cultivated plants where now wild plants are gathered in order to accomplish the work laid out, because of the necessity of keeping within the appropriated sum. For example, the City of New York only allows the sum of thirty cents to be expended per pupil for the purchase of biological material for the entire year, and this amount must cover the expense of the zoölogical, physiological and botanical material purchased for his or her use during that year. This entirely inadequate amount is a factor contributing to the necessity of flower and plant gathering. It is time that a sentiment against the stinting of educational facilities should be aroused. New York is known far and wide as the city that lets out the education of its youth to the lowest bidder, and the meager allowance for material for biological study is in keeping with the reputation she has earned.

Botany could be taught probably with greater success, by treating the subject more fully from the standpoint of plant activities, plant ecology and economic importance. Herbarium preparation and taxonomy, or plant classification, should be a minor consideration, the omission of which would be of little detriment to the teaching of botany.

On Arbor Day, the topic of preservation of our wild flowers should have equal consideration with the preservation of our forests. The two may well go together, for in many respects, later mentioned, the preserving of wild flowers is dependent upon forest protection. The influence of Arbor Day should be as far reaching as possible. The public schools should give it even a broader consideration, and essays should be frequently written, bringing forth many new ideas, which might prove of great help.

Some plants have adapted themselves to live under certain conditions unfavorable for their elimination by gatherers. Some orchids have adapted themselves to swamps and inaccessible

places, or perched upon the branches of trees. Some plants have acquired disagreeable odors, bitter tastes, poisonous properties, or stinging glands which prevent persons and animals alike from molesting them. Others have so protected themselves against man and other destructive forces, that the picking or loss of their flowers do no harm. Some have hardened their stems, so that it is difficult to break them. These are naturally protected and need no special consideration at the present time; but many have not been able to protect themselves against man as an additional destructive factor in their struggle to exist. These are the particular kind that should receive the friendly attention and assistance of man himself.

The wild flower has its own personality. It has struggled hard for its existence, and now exists as an individual and produces its own kind. The more we pick of these struggling individuals, the fewer they become, and the propagation of their kind is unable to withstand and keep pace with their gradual decrease in numbers. When taken on a small scale, one hardly observes the loss which has occurred, but taken in the aggregate, the loss amounts to an incalculable quantity.

Nature has fitted certain flowers for their definite places in the world. The mountain laurel crowns the mountain with its wreath of beauty. The mountaineer loves the mountain for its natural splendor. To him belongs a rightful share in all the beauty by which nature has surrounded his home. The people of the foothills and lowlands love their homes and their surroundings no less dearly than does the mountaineer his wilder range. The flowers of the fields and open woods furnish the pictures of their childhood which live with them as types of beauty unsurpassed. This beauty is their inheritance. So has man on all sides been surrounded by a magnificent wealth of natural beauty in which the flowers, shrubs, herbs, birds and trees play an important part. The gathering of mountain laurel for Christmas and other decorations in winter, and for its beautiful flowers in spring, robs the inhabitants of the mountain of plants which should furnish cover for his game, and beauty that should cheer his heart and compensate for the harder and more rugged

conditions with which he must contend. It is his right to protest again the destruction of the beauty which he enjoys, and it seems only right that man should be entitled to enjoy the beauty by which he may be naturally surrounded. Whatever tends to destroy this adds a degree of unattractiveness to the world in which he lives. There can be no doubt that the beauty of nature has its moral effect upon man's life. It is uplifting and stimulating. Let us therefore strive by influence of word and example, to preach the gospel of the preservation of the beautiful, for its beneficial influence upon the lives and character of the people.

The wild flower is decidedly out of place when taken from its natural home. It is accustomed to be among its neighbors, among the other flowers and trees and beneath the open sky. Picture the native wild flower in a wilted bouquet or used in the home as a decoration, and then picture it in its native haunts, surrounded by all the environments which go to make up its charming society. It is as out of place in the home, amid its alien surroundings, as the robin would be if pent up in a canary cage.

One of the best ways to preserve some of our rare flowers, such as the trillium, the arbutus, the hepatica, the anemone, the gentian and other delicate flowers which are gathered in large quantities, notwithstanding the fact that they wilt very quickly after picking, is to establish for their preservation public and private parks. Such parks have already been established in Massachusetts and New York, and have helped greatly. The help given is worthy of great commendation, and much credit should be given to those who have taken up this valuable line of work. Their work should be brought before the public, which should extend its financial and moral support. There are many parks in and about greater New York which can be used for such purposes. Park commissioners should lay special stress upon the protection of the wild flowers and insist upon the arrest and punishment of persons who injure or destroy any of the plants or flowers over which their authority extends. More parks should be established also. Such property as is not of high value should be purchased by the state, and held as reservations. The state could also

drain many swamps and convert them into park lands in which many native flowers could flourish.

When the movement for the protection of birds was at its height, a veritable wave of sentiment extended throughout the country. Many societies were organized for their protection, magazines devoted much attention to their preservation, and many books were written on the subject. At length, the bird lovers realized that the arousing of public sentiment had gained such headway, that they finally secured the enactment of laws for a more rigid protection, making it a misdemeanor to traffic in birds of song or plumage. The result was that nature-lovers had the birds spared to them. If this can be done for birds, there is no reason why a campaign as far reaching in its effects cannot be begun in behalf of our wild flowers and forests. In the movement for protection of native plants, steps have already been taken to arouse public sentiment, but this has not yet been sufficiently broad to assert itself in legislative enactment, although some legislation on plant and flower protection is even now highly desirable.

Land owners should also be encouraged to post trespass signs, warning the public against the picking of flowers from their property, just as they now post signs forbidding hunting and shooting on their lands. This would have the double effect of preserving the flowers as well as the educational value of impressing the public with the worthy aim and necessity for guarding the wild flowers against extinction. The custom of going into the fields and woods to gather flowers is of ancient origin, but with proper steps, this custom could be materially and gradually changed. Trespassing signs will in some instances be unheeded, but in the majority of cases the sign will carry double weight.

Many plants and flowers must of necessity be destroyed, because of man's encroaching advance upon new or unused territory. Vast areas of plant-life are in this way destroyed in comparatively short time. Timber is cut from farm lands for fuel, or to clear the land for crops. Marshes, swamps and low lands are drained and improved. Owners of large estates destroy plants and trees growing on their property, changing the natural beauty into an

artificial one. The building of towns tends to destroy vast areas of plant-life, and this seems legitimate and necessary, though a deplorable destruction. This is the cost of civilization and must be met by a more vigorous campaign for the prevention of unnecessary plant destruction.

Thousands of trees are cut down annually to every one planted. The destruction is proving a costly loss to humanity. Already the state governments are noting the tree destruction, and are taking measures for a proper increase in our forests. If measures are not taken to restrict certain acts detrimental to plant-life, an extinction of many kinds of plants is inevitable. A factor in any plant's preservation is the maintenance of its natural environment. The connection between forest and wild flower is so close, that the safeguard of the former means a large measure of protection for the latter. Not only must trees be protected for their own valuable service to man, but for the protection they afford to game, birds and plants, which seek the environment of forest homes. The loss of forests means an irreparable loss to the society of plants which have adapted themselves to their shady haunts.

Trees have countless uses in their relation to commerce, manufacturing, climate and man, but their most important value, outside of a financial consideration, is their value to nature. When forests are destroyed, what will take their place in their countless uses? What will take their place in assuring rainfall and indirectly providing sources for rivers? What will shelter the plants which inhabit their fastnesses? If trees are destroyed, plants, both weak and strong, which are protected by them would soon die of drought. Moreover, the streams which provide water for pastures and low lands would dry up, harming directly the plant-life over a much broader area than that covered by the forests themselves. Again, where the heat is continuous, and the sun shines intensely, plants which survive in a shady spot would be exterminated by the removal of the forests. Thus, forest preservation insures a continual existence of shade-loving plants.

The annual destruction of trees is enormous. The various uses for timber are so numerous that only a few of the most im-

portant ones will serve to show the reasons contributing to our forest destruction. Timber is used for the manufacture of furniture, paper, wood alcohol, excelsior, charcoal, medicines and other products besides its uses for buildings, poles, ties, fences, etc. To further protect our forests not only should logs be allowed to enter the United States duty free, as now, but also finished lumber should be allowed to enter duty free.

Fire is another great destructive agent of forests and forest plants. It destroys areas of timber all over the country. Not only does it injure forests, but it destroys other plant-life indigenous to it. Trees are continually hewn to build the hut of the hunter, and to supply his fire. Many forest fires have been started from camp fires which were not extinguished before they were left. Others have had their origin in the careless throwing away of lighted cigars or cigarettes. The state has lost millions of dollars' worth of timber from fires, and the annual loss is so enormous that a greater appropriation for services of more fire wardens should be made than at present. Their valuable work more than compensates for their services. It is only reasonable that this should be done, as the loss incurred would amount to more than can be afforded.

In conclusion, I would recommend that for the preservation of our wild flowers and native plants, the following suggestions be carried out:

1. That the education of the public along the lines of flower protection be more vigorously pursued. When this is properly done, public enlightenment and sentiment will place restrictions upon the individuals who are guilty of needless plant destruction. This education will also result in a fuller appreciation of the world about us.

2. That methods should be adopted to discourage the picking of specimens by students. To this end I recommend the organization of societies to secure the coöperation of school children and nature-study classes and clubs; also for the study of local conditions, with a view to giving special attention to the species most liable to decrease.

3. That a broad use of the press should be made to bring before

the public the necessity of the work of wild flower preservation, and to create a public sentiment for coöperation in this work.

4. That the methods of teaching nature-study in public schools be modified, and cultivated flowers be substituted instead of wild flowers throughout the state. To this end I recommend that the matter be presented to the various boards of education with a view of securing an allowance sufficiently liberal to permit of a proper study of type forms in the school, without resorting to a collection of wild flowers for that purpose.*

5. That laws should be enacted, making it a misdemeanor to traffic in native wild flowers.

6. That the state and its cities secure more lands for park purposes, and therein furnish protected homes for many of the wild flowers that tend towards elimination.

7. That the posting of signs forbidding the picking of flowers be encouraged and supported.

8. That our forests be further protected, and that our legislators be apprised of the necessity of planting and developing new forests to a greater extent than has been done in the past. Our legislatures should be impressed with the need of a greater annual appropriation for the protection of forests against fires, and the number of fire wardens and equipment for fighting forest fires should be materially increased.

Realizing the great amount of work to be done, there is need for the most vigorous efforts on the part of us all to secure the ends desired. May the campaign so well begun be strenuously continued, that the world in which we live may be brighter and better for the labor expended in this noble work of the *preservation of our wild flowers.*

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*In this connection it is encouraging to note that the following wild flowers have been eliminated from the list of botanical supplies in the New York public schools during the past year: trailing arbutus, wild columbine, fringed gentian, hepatica, Indian turnip, moccasin flower, trillium, wild orchid; and it is proposed to substitute cultivated plants for wild ferns, Solomon's seal, wild geranium and others.—EDITOR.

BOTANICAL EXPLORATION OF THE CAYS ON THE NORTH COAST OF CAMAGUEY PROVINCE, CUBA.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: Sailing from New York City on September 22, Nuevitas, Cuba, was reached on the morning of October 2, after the usual delay in Nipe Bay, where immediate steps were taken to secure a boatman to take me about the cays to the westward.

The "Albertia," an open, cabinless, flat-bottomed, center-board boat about eighteen feet long, the usual type of craft used in these waters, was secured, and headquarters were established at Tiffin, an American colony, about six miles from Nuevitas and near Marinavo Bay, where accommodations were provided by Mr. Martin Bessler, resident manager of the colony.

Owing to much rain and adverse winds it was not until October 7 that a start was made, when in company with a Cuban sailor, I left Tiffin landing and put in at Port Biaro. From here I walked to La Gloria in quest of a boy to accompany us, and was fortunate to secure Raymond Jenkins, an American lad, well versed in Spanish, whom I had known by previous acquaintance to be an apt woodsman. Early next morning we started for Cayo Romano. Passing Guajaba Channel, a short stop was made at the extreme northwestern point of Cayo Guajaba, a white sandy coast, similar to Punta Arenas of Cayo Sabinal which I visited the previous spring; its flora also was the same so that very few specimens were taken and we continued westward along the seaward side of Cayo Romano, whose eastern extremity was seen to be a conglomeration of mangrove thickets and shallow lagoons, to Pueblo Romano, a small settlement of the employees of a henequen plantation. The remainder of the afternoon and the greater portion of the next morning was spent here in collecting among the low limestone hills, which were covered with a sparse shrubby growth. Very few large trees were seen; a bluish-leaved *Copernicia* and a silvery-leaved *Coccothrinax* were very abundant.

Sailing about noon on October 9, we proceeded along the sandy coast to what seemed to be the end of the range of hills paralleling the coast, and marked on some maps as Silla de Cayo, with an

altitude of 230 feet, although they did not seem to us to be over 100 feet high. On landing we found that the beach presented the usual sea-coast plants, back of which were a few large trees and a great number of silvery-leaved fan-palms, called by the Cubans "mira guana." This is a species of *Coccothrinax* and its leaves are used for thatching. The hills were very rocky with little and often no soil, but still supporting a dense growth of shrubs and a few small trees. On the other side, however, the hills were less steep, less stony, often quite fertile and supported some good sized trees mostly of the same species as those seen in smaller form on the seaward slope. We camped here in the net-house of a fisherman and the experiences with heavy rains, high winds and biting insects was such that it was a pleasure to embark at day-break on October 12 for Cayo Paloma, the largest and outermost of a group of small cays situated between Cayo Romano and the end of Cayo Cruz.

This cay is about a mile long and half as wide, and consists of a limestone hill, scarcely 100 feet high, covered with a low forest growth, some of the trees, however, attaining large size. Our stay of a day and a night on this beautiful island was a constant battle with insects. Since the boatman had refused to anchor the boat off shore for sleeping purposes, our camp was located upon the land, and as the collections were not drying well in spite of their being transferred to dryers that had been passed over our charcoal stove, I concluded it was best to return to headquarters early in the morning of October 13. In returning we were caught in several severe squalls before reaching Cayo Romano, after which, however, we had good weather and a stiff wind from the west. Keeping on the seaward side of Cayo Guajaba, a good view of its entire outer coast was had, much of which is white sandy beach fringed with *Coccothrinax*, among which was noted one large tree of the beefwood, *Casuarina equisetifolia*, called "pino" by the sailors, and thus accounting for the statement made to me last winter that "pine trees grew on Guajaba." Much of this outer coast, however, is composed of mangrove swamp broken up by shallow lagoons. A small hill near the northwestern corner and a range of low hills passing through

the middle in a northerly direction appear to be the only high land upon it. Passing through the Carabelas Channel to inner waterways we reached Tiffin landing about six o'clock in the morning. After remaining at Tiffin until the morning of October 18, curing the collections and awaiting the overhauling of the boat, which had developed a bad leak on the first cruise, we started out with the intention of rounding Cayo Cocos. The weather being very wet and the sea rough, we were compelled to tie up for a time on Cayo Piedra, a part of Cayo Guajaba, a point touched on my trip last winter but for which I did not get a name at that time. Several species not then seen by me were collected.

The sea having quieted down, we again proceeded and reached a point opposite Punta Guanaja by nightfall where we anchored, spread a canvas over the boom and spent a fairly comfortable night in spite of the heavy rain. Early next morning we continued westward, but our speed was interrupted by the group of low mangrove islands which separates the bays of Guajaba and Jiguey. The narrow, very tortuous pass called Zanja de la Batista, made navigation very tedious, so that it was quite late in the afternoon when our first stop was made at Punta Jucuro, on Cayo Romano, this being the first firm land seen along the southern coast. Here, however, a wide strip of fertile black soil separated the sandy beach from the interior lagoon and supported a forest growth of medium sized trees, some of them carrying many bromeliads. Two fan-leaved palms with tall thin trunks grew together, one a *Coccothrinax* called "mira guana," the other probably a *Thrinax* and called "guana lana," the latter having a woolly coating between the layers of its bud. This woolly substance is scraped off and used for stuffing pillows, etc. It is said to be on sale at Nuevitas, at about twenty-five cents per pound, but I failed to find any so exposed. Next morning, October 20, we landed at Salina de la Principal, the landing place for a primitive salt works long since abandoned. The beach here is made up of finely broken shells. *Conocarpus* occurs at the water's edge, the grassy thicket in the rear being made up of common coastal species with *Metopium* the principal small tree. Dense thickets of *Pithecolobium* were

quite frequent. Back of this sandy ridge which rises but a few feet above tide is a great salt marsh, but its borders, which were examined for some distance, yielded nothing of unusual interest. I was afterwards told that a tramway once extended from here to the seacoast of the cay. Had I known it I would probably have undertaken to follow it. Continuing westward from here it was nearly dark when the boatman announced that we were at the nearest and best landing place from which to reach Loma de Loro, a prominent hill on Cayo Romano. We anchored here for the night. The barking wild dogs on the shore, however, disturbed our slumbers, and upon landing next morning we soon discovered the cause — the carcass of a recently perished horse, the first evidence I had of the statement that "wild" horses were quite numerous on this cay. Further evidences were seen during the day, but the animals themselves were not met with. Making an early start we were compelled to wade often up to our waists through water which covered the three and one half miles of mostly sharp-pointed rock, with here and there a clump of stunted *Avicennia* or a small grassy salt marsh lying between the hill and the coast. The hill consists of lime rock. It is about a mile in diameter and probably 100 feet high, apparently sloping gently in all directions. The southern base is bordered by a dense thicket of shrubs, at this season standing in water and in many cases entirely covered with Spanish moss and other bromeliads. The slopes are covered with rich black soil and small broken limestone, supporting a forest of medium-sized trees, many of which, however, were not in flower or fruit and consequently not collected. The groves were almost entirely composed of *Pseudophoenix Sargentii*, called by the fisherman "palma guaney." These palms occurred in all sizes from fresh seedlings to fruiting specimens, probably 35 feet tall. The trees occurring most frequently that were known to me were *Bursera*, *Metopium* and *Coccolobis laurifolia*.

Returning to the boat late in the afternoon, we set sail and succeeded in reaching Cayo Arto before nightfall. This cay is perhaps the largest and highest of the group of small rocky islands separating the bays of Jiguey and Perros, known as the

Cayos Neuvo Canal. It is scarcely a mile long and rises to an altitude of about 60 feet, its banks are very rough and rocky. The hill itself is made up of lime rock, large boulders forming the surface, the interstices being filled with rich blackish soil which supports a rather dense forest growth. Some of the trees attain a large size and remind one very much of Cayo Paloma. Large specimens of a columnar *Cereus* were very plentiful. One of these protected from the wind by a clump of trees was fully 20 feet tall, its upright branches spreading across a distance equaling its height and supported by a short trunk fully one foot in diameter. Flowering specimens of this cactus were secured and ripe fruit was found on a neighboring island later in the day. Cayo Calabaza, similar to the last, but smaller, was also touched and I walked or climbed around Cayo Largo which is still smaller and very rocky. A snake-like cactus, *Selenicereus*, was very abundant here and I collected cuttings of what appeared to be five distinct forms. The iguana, a large lizard, was frequently seen on these rocky islands. These cays are occasionally visited by boatmen in search of fresh water which accumulates in the crevices of the lime rock, in the rainy season. They call it "agua dulce" and "agua buena," but it is neither sweet nor good, if the supply we secured was a fair indication of its quality. From these small islands we crossed the eastern end of Perros Bay, landing on a white, sandy beach, fringed with *Conocarpus* and backed by a thicket of *Metopium*, behind which was the ever-present laguna. The most interesting plant seen here was a large round-topped, red-barked, Malpigiaceous tree.

The boatman having announced that we were now on Cayo Cocos—the accuracy of which I, however, doubted—and as it was quite apparent that it would be folly to attempt to carry out the original plan of going around Cocos, we sailed northeastward, intending to go through Paredon Channel and endeavor to follow along the seaward coast of that cay for some distance, in order to make several landings before turning "homeward" via Cayo Paredon Grande, Cayo Cruze and the seaward side of Romano; but after several hours of tacking, poling and sticking on the mud in a very shallow body of water, the boatman announced that the

channel was closed up and that it would be impossible to get to the seaward side of the cays, unless the channel that is supposed to cut Romano into two parts was open, we would have to return over the route we had come to Guajaba Channel before we could get outside. Having suspected for some time that the boatman, who was a splendid sailor, had passed beyond the territory with which he was familiar and was no longer to be depended upon as a guide, I insisted that he had given no evidence that we were in the channel or that we had been on Cayo Cocos, and that we must go at least ten miles farther westward before I would consent to return. Fortunately, at this point, we sighted a group of fishing boats in that direction and set sail towards them, in quest of information. These we overtook about dusk and were informed that the mouth of the channel was at least three leagues to the west. They also told us that the bay side of Cayo Cocos was made up of a conglomeration of mangrove thickets and shallow mud-bottomed lagoons and that it would be impossible to make a landing as we did not have a small row-boat. It was long after dark when we found a suitable anchoring place for the night. Next morning, October 23, we sailed some distance westward along Cayo Cocos in quest of a landing place, but were compelled to give it up after I had made several unsuccessful attempts at wading through mud and a tangled mat of ribbon grass. Later on, however, we made a landing on the channel shore where a ledge of lime rock was exposed to the water. Here *Conocarpus* was the principal woody plant. Back from the shore a salt marsh formed the boundary of an extensive lagoon. The number of common weeds here plainly indicated that it was the occasional landing place of fishermen. From this point the channel narrowed very rapidly and we passed through several miles of very deep water. The mangrove (*Rhizophora*), of considerable height, was the only vegetation visible and several alligators were seen during this tedious trip, for it was necessary to row much of the time, there being no wind and too much depth of water to use the pole.

It was quite late in the afternoon when we got on the outside and it was seen that this part of both cays was the same monoto-

nous combination of *Rhizophora*, mud and water. The view of Paredon Grande Light and a little rock out in the sea was inspiring, and as I had not seen such a rock island in Cuba I was anxious to examine it, thinking it might harbor some specimens of cacti. The boatman, however, pronounced it too dangerous to attempt in our small boat, saying it was fully twelve miles out in the open sea and the weather was so unreliable; in fact, he did not wish to continue westward along the Cocos coast. However, after passing a long stretch of the mangrove formation, we met with a hard, lime rock shore and made a landing in time to do an hour's collecting before sundown. The night spent here will long be remembered, for although we were anchored probably 1,000 feet from shore and a mild breeze was blowing in from the sea, it was a continuous battle with mosquitoes of large size which continued to annoy to us until daybreak.

Next morning I explored the dense thicket between the coast and an extensive lagoon, about three fourths of a mile inland. The vegetation was rather vigorous, considering the sparseness of the soil and hardness of the rocky surface. A large number of species not seen before were collected. Probably the most conspicuous feature of the place was the numerous spreading trees of a species of *Plumeria*. An open grassy place, the remnants of a shack, and several fresh-water holes plainly indicated that the place may have been occupied, from time to time, probably by turtle fishermen, for it is said that there are no permanent inhabitants on the entire cay. The day being an unusually fine one, and conditions being favorable, we started for the rock already mentioned, which I afterwards learned was called Cayo Pelon. Reaching it in the middle of the afternoon, it was found to be a solid, soilless lime rock, about 1,000 feet long, about 60 feet across its widest point and about the same height. During a high sea it is washed over so that little vegetation can exist there; but twelve species were seen upon it, four of them woody, all being common seaside plants. No cacti were found. Leaving here as soon as possible, for our boatman was getting uneasy at what he said were signs of bad weather, we headed eastward towards Paredon Grande Lighthouse, which we reached shortly

after dark after much troublesome sailing, the last half of the distance being through very shallow water. As the lighthouse keeper had not yet retired, Raymond persuaded me to go with them to the top of the lighthouse. The effort was fully repaid by the moonlight view of the surrounding region, showing that between the sea and the mainland of Cuba there was a vast region of absolutely useless territory, an insect-breeding conglomeration of mangrove swamp and shallow, often mud-bottomed lagoons, Cayo Paredon Grande itself being a triangular crust surrounding a large lagoon. The night was spent in comfort in the cabin of the mail boat, by the kind invitation of its captain, who insisted that it would be impossible to sleep outside, on account of the insects.

The entire day of October 25 was spent in collecting on this cay. The nothernmost point, upon which the lighthouse is situated, is hard lime rock 30 or 40 feet high, and in severe weather is washed and beaten by wind and wave. The growth upon it is mostly all shrubby and more or less contorted. The northwestern side is sandy beach with a typical coastal flora—several grasses and an abundance of "mira guana" (*Coccothrinax*), which grows in great quantities on most of the cay, often forming large groves. Continuing farther along, the beach is replaced by mangrove swamps. The northeastern coast for the first mile or so is high rock cliff, followed by a series of sand dunes 25 to 30 feet high and supporting a flora the like of which I had not seen before in Cuba. These dunes shift considerably, covering and uncovering the palms and small trees that grow in the vicinity. Here too the palms are mostly found on the inner or lagoon side, and not on the shore side, as on the northwestern coast. The dunes gradually become lower, and finally there is a flat sandy beach which in turn gives way to the mangrove formation. It is said that the south coast of this cay is mangrove with shallow muddy lagoons, and that the channel separating it from Cayo Romano is impassable for the smallest of boats. The following night was spent on our own boat in the little harbor, a stiff breeze blowing in from the sea protecting us from the ravages of mosquitoes and other insects. Next morning we sailed for Cayo Cruze, making

several short stops at points eastward of Paredone Grande, but their exact position I was unable to ascertain except that we passed inside the Cayo Anton and Cayo Caiman and many other smaller low islands, reaching a landing place at the west end of Cayo Cruze by evening. Next morning I crossed this cay to the seaward side which is low flat white sand with the usual plants of such a region. The south side, upon which we landed, is flat lime rock covered with the usual shrubby growth found in such situations. The afternoon was spent on shore caring for the collections, it being one of the few bright and rainless days experienced on the entire trip. Toward evening we crossed over to Cayo Romano in order to examine the low hill known as Alto Aji, and anchored for the night at a short distance from its base.

The morning of October 28 was mostly devoted to an examination of the eastern end of this hill, which is about one and one fourth or two miles long and probably not over a mile wide at any point. Beginning at the water's edge it rises gradually to a height of 40 or 50 feet, and is like the other elevations that were examined in being made up of lime rock. Its soil between the loose surface rock is quite fertile and some medium-sized trees occur among the tall shrubbery. Numerous seedlings of *Pseudophoenix Sargentii* occur on the north slope, but fruiting specimens were seen only on the southern slope where they were very abundant and of large size. From here we again crossed over to Cayo Cruze, landing at the mouth of the channel which the maps show as cutting the cay into two parts. Its outer end, however, was found to be closed up entirely by drifting sand, although the southern end was comparatively deep. A decaying dock, the ruins of a rather large house, and numerous cocoanut trees were some of the indications that the place was once the pretentious home, probably of a sponge merchant. Several small grassy plots, and fresh-water pools surrounded by cyperaceous plants, and a good fresh-water spring were some of the features that marked this spot as an unusual one for this region. Towards the sea was a low sandy plain, the sand being piled up into low irregular ridges and often packed into angular rock-like masses

with a blackened surface, but crumbling under one's weight. Shrubs usually growing upright in the lee of such masses were of the same species as the straggling and contorted ones exposed to the wind. The sea-grape, *Coccolobis Uvifera*, was very abundant here, but it was by no means the predominating feature. A *Coccothrinax*, apparently the same species as observed elsewhere, was very abundant. Eastward of the former channel the sand was less disturbed and rather more barren, although several fresh-water lagoons occur here, these being a source of considerable disappointment as they were apparently barren of all plant-life and scarcely anything grew on their ever-changing margins. Leaving here during the afternoon we sailed around the southern projection of Cayo Cruze and anchored for the night between Cayo Santo and Cayo Palomo, visited on the previous cruise. Next morning a landing was made on the former to get wood for fuel, and specimens of a shrub not observed elsewhere were secured. Sail was then set for Pueblo Romano, where a stop was made early in the afternoon to inquire about a large savanna said to exist to the south of the hills previously examined, but indefinite information and the inability to secure a satisfactory guide led me to abandon the idea of further investigation, so we embarked for Tiffin landing which, by sailing throughout most of the night, was reached early Saturday morning, October 30.

The curing of the collections, which had received several soakings, and their packing for shipment required most of the time until November 6, when a start was made on the third cruise, which was intended to encircle Cayo Guajaba. Fortunately, Mr. E. G. Franks, owner of the "Albertia," who had taken me about Nuevitas Bay and the Sabinal so satisfactorily the previous winter, found it convenient to take charge of the boat. Mr. Carl Schrickle, of Tiffin, also volunteered to go along, so that the party consisted of four persons. Weather conditions were against us from the start, so that we were compelled to tie up to the mangroves several times for protection before we reached the first landing place on the bay side of Guajaba, at the foot of the range of hills that cross the island in a northerly direction. These are low lime rock ridges; their

greatest altitude is probably less than 100 feet, their covering mostly shrubby, although there are occasional small areas of woodland where the trees attain fairly large dimensions. Groves of *Pseudophoenix Sargentii* composed of very tall, slender individuals occur near the shore as well as at the summit of the southernmost hills. Well towards the interior a fresh-water swamp was surrounded by a dense, dark thicket which harbored a number of plants I did not recognize, conspicuous among them being an orchid without leaves or "bulbs," the thin flowering stem arising from a cluster of fibrous roots clinging to small twigs and branches, the flowers being about two thirds inch in diameter and having the appearance of white moths in flight. The only other high land on this cay is Loma Checa, near the northwest corner. It was hoped that it could be reached by walking from the hills above described, but we soon found that the intervening lagoons would prevent this, so we set sail for it early on the morning of November 9, but could not get to it by boat on account of shallow water and were compelled to wade through mud and water for several miles before reaching it. Here we met with great flocks of flamingos and numerous other water birds. The hill is a small one, scarecly 40 feet high, and like all others examined on these cays, is made up of lime rock. Its surface is covered with very good soil, few large stones being seen. The greater portion has been cleared off and is covered with guinea grass. Some cocoanut and mango trees also attest that it was inhabited in recent years. At present, the guinea grass furnishes fine grazing for a herd of "wild horses," numerous evidences of which were seen, but the shy animals themselves were not discovered. A portion of the hill is covered by forest growth similar to parts of the larger hill already described.

The leafless orchid was also seen here and some of the trees at the foot of the hill were entirely covered with "Spanish moss" (*Tillandsia*). From the top of the hill a view was had of the region lying between us and the sea; it seemed to be low, flat land similar to that encountered on the Sabinal last spring. Several clumps of palmettos were seen, the only ones noted on any of the cays except the Sabinal. It was here remarked that no royal

palms had been seen on any of the cays. A view of the sea showed it to be very heavy and upon our return to the boat it was evident that it would be impossible to go outside in our little craft, so we reluctantly set our course "homeward," but were soon compelled to tie up under the lee of tall mangroves for protection from wind and wave, and the night spent there was none too comfortable. Next morning, with considerable trouble and much risk, we crossed the bay to Port Biaro to permit Raymond to disembark for his home at La Gloria. Thinking the other side was the best, we recrossed the bay and were much relieved when we reached several tall mangroves where we tied up for the greater part of the day. We had reason to congratulate ourselves that we had no accidents and were safely on land while the storm continued for several days longer. It had been my intention to cross over to Cayo Sabinal, to a low hill of which I had no knowledge when that cay was explored on my previous trip, but this storm prevented my doing so and it was not until November 20 that I succeeded in having the collections cured, packed and shipped to New York.

Having also shipped my outfit to Nipe Bay via coastwise steamer, I left Tiffin on the morning of November 21, stopping at Queen City, and made an excursion into the dry, barren savanna to the eastward of the railway, for the purpose of securing better material and photographs of the peculiar waxy-leaved palm seen there the previous spring. In this I was quite successful and also found a small thicket-forming fan-leaved palm, probably a *Thrinax*, which fruited when scarcely more than one foot high and was not seen to exceed more than six feet. I got into Las Minas quite late that night and went by train to Camaguey next morning, noting that the waxy-leaved palm also occurred in the dry savanna to the west of the railway some five or six miles north of that city.

During the intervals between the cruises about the cays, I made trips when practicable into the country immediately around Tiffin. This region is mostly covered with a growth of upright shrubs and small trees, the foundation being lime rock soil. On the lower lands are either wet savanna or "jucuro" forests

and this time of the year were under water. The higher thicket-covered region was under cultivation before the "ten-years' war," and this probably accounts for the almost entire absence of large trees, the soil being as a rule rich and deep.

To summarize the results of this work it may be briefly stated that the larger number of these islands are made up of a conglomeration of small areas of land, mangrove swamps and shallow lagoons. The proportion of high land is very small and occurs mostly in ridges running in a northerly and southerly direction, and although there are a few fertile spots it is as a whole very poor and barren. The insect pests, of several varieties, are particularly abundant and exceedingly active. At the present time there are very few inhabitants. On the Sabinal, the keepers of Maternillos Light are supposed to be the only residents. Cayo Guajaba has no permanent inhabitants, but a number of Nuevitas fishermen have shacks on its seaward coast and remain there during the turtle fishing season. On Cayo Romano, aside from the people connected with the henequen plantation, but two fishermen and their families live. Cayo Cocos is said to be unfit for human habitation. Cayo Paredon Grande has the lighthouse keepers and their families as its only citizens. Cayo Cruze is supposed to have but one sponge fisherman's home occupied. One or two families may reside on some of the small rocky cays, as Palomo for instance. In former times, however, there were a good many more. The flora of these islands is as a whole quite different from that of the Cuban mainland and I believe a study of the material collected will prove it to be largely Bahamian.

In concluding this narrative of this part of my winter's work in Cuba I may say that in spite of the many discomforts and some hardships experienced, my interest in the work is such that I would be pleased to continue it westward, completing Cayo Cocos and touching some of the many smaller islands of the chain stretching on to Cardenas, some of which are situated fully one degree north of those already visited.

Respectfully submitted,

J. A. SHAFER.

CONFERENCE NOTES.

At the conference meeting held in the library on May 4 Mr. George V. Nash exhibited two living plants in flower of the genus *Cattleya*. He remarked that this genus of orchids was distributed from Central America to southern Brazil, being especially numerous in the Andes. One of the plants exhibited was *Cattleya Skinneri*, from Gautemala and Costa Rica. The other was a form of this nearly white. This white-flowered form led the speaker to remark upon the occurrence of such forms among the orchids. He stated they were known in a great many species. One of the most recent known occurrences was a white form of *Cattleya Gigas*, which had come into flower at the establishment of Messrs. Lager & Hurrell, at Summit, N. J. This was the first white-flowered form of this species known, and the speaker had been informed that the owners held the plant at $2,000.

Dr. W. A. Murrill read by title a paper on the Polyporaceae of Jamaica, containing a record of 115 species. This paper will appear later in MYCOLOGIA.

Dr. Charles H. Thom, mycologist in cheese investigation for the United States Department of Agriculture, gave a discussion of the relation of certain moulds to the process of cheese ripening.

From the standpoint of the biologist cheeses may be grouped into two classes: (1) Those ripened by molds, (2) those ripened by bacteria. By far the larger part of the five hundred or more kinds of cheese belong to the class in which bacteria play the predominant part in the ripening process. But there are a small number of varieties and these including some of the best known of all kinds, in which mycelial fungi play the most important rôle.

A study of these cheeses has been conducted jointly by the United States Department of Agriculture and by the Storrs Agricultural Experiment Station at Storrs, Conn., for the past six years.

The mould-ripened cheeses fall into two groups—those with the mould on the outside and forming a distinct rind and those with the mould forming green streaks inside the cheese.

The first class is represented by two famous French varieties

Camembert and Brie. Camembert is probably the best known of these and it is to this cheese that we have given the most careful study. In the ripening of Camembert it was long known that moulds had some function. The French investigators, Roger and Mazé, considered that this consisted in changing the reaction of the freshly made curd from acid to alkaline after which bacteria completed the actual softening of the curd. It has been shown however by this investigation that a species of *Penicillium* (*P. camemberti* Thom), which has been found to be always present upon the cheese secretes an enzyme capable of changing the hard sour curd of the newly made cheese into the soft ripe cheese although without the characteristic flavor which seems to depend upon the action or *Oidium lactis* and various species of bacteria. This species has not been found outside the cheese work in America. In the commerical handling of Camembert cheese this organism has been shown to develop best under the conditions found in the factories of Normandy. Success in the handling of this cheese seems to depend upon such a regulation of conditions as will permit just the right development of the Camembert *Penicillium*, of *Oidium*, and of the slime bacteria which also grow in the rind of the cheese. These conditions briefly are: (1) A fresh cheese should contain between 55 and 60 per cent. of water which is reduced during the ripening period of about four weeks to 48–50 per cent.; (2) a relative humidity in the ripening room of 85 to 92 per cent.; (3) temperature between 50 and 58° F. Within these limits a considerable variety of results can be secured by slight changes in one or the other condition. If the humidity is too high; bacteria and *Oidium* will completely overgrow and suppress the *Penicillium;* drop the humidity 2–3 per cent. and they can be nicely balanced; drop it again as much and the *Penicillium* will completely cover the cheese and smother all other growth; drop the relative humidity still again and *P. camemberti* loses its dominance and is more or less completely replaced by green species. Success is thus seen to depend upon accurately knowing the conditions best suited to the forms to be handled and then producing these conditions. In America, this problem calls for the building of factories spe-

cially equipped for temperature and humidity control. The right conditions are furnished by nature in Normandy.

The green mould cheeses are more or less completely penetrated by *Penicillium roqueforti*. The best known of all these cheeses is Roquefort. This is probably also the most famous of all kinds of cheese. In this cheese the mould is carefully inoculated from bread cultures which are propagated by the best of laboratory methods. The cheese is made so that it contains channels, cracks, air-cavities throughout from the first. This permits the mould to begin growing as soon as the cheese is made. The cheese is much harder than Camembert—about 40 per cent. water. It requires a longer time to ripen also. The minimum ripening period is probably at least two months, while the time actually used is generally much longer. Here as in Camembert the proteolytic changes, which are very complete, are attributable to the mould, but in this case the mould is probably also responsible for the production of the fine flavor which is so much sought.

As showing how clearly this is a case of natural selection, it is only necessary to call attention to the fact that Stilton cheese made from cow's milk in England and Gorgonzola made in Italy are also ripened largely by the agency of the same species but in these cheeses inoculation with the mould is not generally practiced. The cheeses are, however, pretty well filled with mould in fairly pure culture. It is thus seen that the Roquefort species is so well adapted to the conditions found within such cheese that once in a factory it becomes the dominant species within such cheeses without inoculation.

Many other species may be found accidentally in or upon cheese. *Penicillium brevicaule* is a frequent contamination of Camembert. Mucors are often found, but the species discussed above are those which have real part in cheese ripening.

Mr. E. D. Humphreys gave the results of recent determinations of Triassic fossil plants.

The work of arranging and identifying the specimens in the various miscellaneous collections of fossil plants in the possession of the Garden has revealed several that were of more than ordinary interest. Among these, was a small one of Triassic plants

from the Santa Clara coal field, Sonora, Mexico, which is of importance because the Triassic flora of North America is, comparatively, so little known. It consists of about two dozen specimens and about half a dozen species. These latter include two or three species of well preserved ferns (one of which is represented by both fertile and sterile fronds), a remarkably fine equisetum (probably a new species) showing the teeth and branches with great clearness, a cycad or two, and a conifer. All are embedded in a hard fine-grained shale that splits rather unevenly. Specimens of a number of species were exhibited.

FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Prof. LeRoy Abrams, of Stanford University, California, has been granted a research scholarship in the Garden for two months to aid in his studies on the trees and shrubs of southern California.

Mr. R. C. Benedict is also in residence for a month under a scholarship grant and is pursuing his studies of the fern tribe Vittarieae in connection with work on "North American Flora."

Mr. W. W. Eggleston has recently accepted a position as assistant botanist of the Forest Service of the United States Department of Agriculture. He has been detailed to study poisonous forage plants in Colorado in coöperation with the Bureau of Plant Industry.

Dr. Charles E. Fairman, a physician of Lyndonville, N. Y., has spent a week at the Garden looking over material and literature preparatory to a monograph of one of the families of the fungi. Dr. Fairman has been for many years past an enthusiastic student of fungi and through his publications his name is well known to mycologists.

Dr. Arthur Hollick attended the meeting of the American Association of Museums at Buffalo, from May 31 to June 2, as the delegate representing the Garden. Dr. Hollick read a paper on "The Paleobotanical Collections of the New York Botanical Garden," in which the origin and development of the collections and the methods of installation, arrangement and labeling, were

described and discussed. Advantage was also taken of the opportunity to visit the Buffalo Botanical Garden, where half a day was occupied in an inspection and study of the grounds and conservatories under the personal guidance of the Director, Mr. John F. Cowell.

Dr. H. H. Rusby, chairman of the scientific directors, and honorary curator of the economic collection of the Garden, will spend the summer in Mexico in connection with his investigations of the new rubber-producing tree, *Euphorbiodendron fulvum*, to which subject he has already devoted considerable time and attention for the Consolidated Palo Amarillo Rubber Company. Advantage will be taken of this opportunity for making extensive collections for the Garden, especially of economic material, and for the investigation of Mexican drugs and medicinal plants in the interest of the United States Pharmacopoeia, of the new Revision Committee of which he is a member.

The main part of the collections of desert plants, contained in houses nos. 5 and 6 of conservatory range no. 1, have now been transferred to the nearby court, as has been the custom for a number of years back. The space allotted outside to these collections this year has been increased, two additional beds having been provided. Of the five beds, two are devoted to American desert plants, one to such plants from southern Africa, another to desert plants from the Old World generally, and the remaining bed to the orpine family, which has representatives in both the Old World and the New. A comparative study of these groups is a matter of much interest.

In the course of a stroll through the Garden recently, Mr. R. S. Williams and Mr. R. C. Benedict found along the east river-path below the Boulder Bridge a patch of ground covered with fresh leaves of the red maple evidently from a tree which hung over the path. The leaves were attached to small fruiting twigs and a close examination showed that they had been cut off cleanly, presumably by gray squirrels in search of a meal of the seeds. Only the one tree seemed to have been so visited.

Meteorology for May.—The total precipitation for the month

was 2.22 inches. Maximum temperatures were recorded of 75.5° on the 7th, 72.5° on the 11th, 83.5° on the 21st and 87° on the 29th. Also minimum temperatures were recorded of 38° on the 6th, 37.5° on the 15th, 42° on the 17th and 48° on the 28th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

121 specimens of *Crataegus* from Missouri. (By exchange with Mr. E. J. Palmer.)

17 specimens of North American mosses. (By exchange with Dr. A. J. Grout.)

19 specimens of drugs for the Economic Museum. (Given by Dr. H. H. Rusby.)

6 specimens of mosses from Pasadena, California. (By exchange with Mr. Chester C. Kingman.)

1 specimen of *Eruca sativa* from Lancaster County, Pennsylvania. (Given by Mr. J. J. Carter.)

2 specimens of hepatics from Utah. (Given by Professor Marcus E. Jones.)

1 specimen of *Crataegus* from Louisiana. (Given by Mrs. P. S. Lovell.)

1 specimen of *Crataegus* from North Dakota. (Given by Dr. J, Lunell.)

26 specimens "Fungi Dakotenses," fascicle 4. (Distributed by Dr. J. F. Brenckle.)

1 specimen of *Camptothecium nitens* from Connecticut. (Given by Miss Annie Lorenz.)

1 specimen of *Hecistopteris Werckleana.* (Given by Prince Roland Bonaparte.)

100 specimens "Fungi Columbiani," Century 32. (Distributed by Mr. Elam Bartholomew.)

1 specimen of *Polyporus fissus* from New York. (Given by Miss Helen Palliser.)

10 specimens of fungi from Caucasus. (By exchange with the Bureau of Plant Industry, Washington, D. C.)

78 specimens from Vancouver Island, British Columbia. (By exchange with the Geological Survey of Canada.)

104 specimens from British America. (By exchange with the Geological Survey of Canada.)

2 specimens of *Scouleria marginata* from Washington. (Given by Mr. Thomas A. Bonser.)

4 specimens (types) of *Leucobryum.* (By exchange with Mr. Jules Cardot.)

28 specimens of mosses from Uruguay. (By exchange with Dr. Florentin Felippone.)

150 specimens of flowering plants from Illinois. (By exchange with the Field Museum of Natural History.)

26 specimens of mosses from North America and Europe. (By exchange with Professor John M. Holzinger.)

13 specimens of *Crataegus* from Washington, D. C. (Given by Mr. H. C. Skeels.)

15 specimens of *Crataegus* from eastern Pennsylvania. (Given by Dr. C. D Fretz.)

PLANTS AND SEEDS.

1 plant of *Pachyphytum* from Mexico. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

2 plants of *Echeveria setosa*. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

12 plants for the herbaceous collections. (By exchange with Mr. L. S. Livingston.)

44 plants for herbaceous collections. (Given by Mrs. N. L. Britton and Miss C. C. Haynes.)

47 orchids from Mexico. (By exchange with Mr. J. C. Harvey.)

3 plants of *Pinus virginiana*. (Given by Mr. Wm. K. Bassett.)

16 orchids. (By exchange with Mr. J. A. Manda.)

17 plants for conservatories. (By exchange with Mr. H. D. Darlington.)

1 plant of *Cycas revoluta*. (Given by Mr. Joseph Karlik.)

512 plants for the hardy collections. (Purchased.)

97 plants from Mexico and Texas. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

264 plants derived from seeds from various sources.

64 packets of seeds. (By exchange with the Botanical Garden, Bonn, Germany.)

1 packet seed of *Catalpa speciosa*. (By exchange with C. J. Lockyear.)

30 packets of Mexican *Ipomoea* seed. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

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W. BAYARD CUTTING, JAMES A. SCRYMSER.

Term expires January, 1912.

N. L. BRITTON, JOHN I. KANE,
ANDREW CARNEGIE, W. GILMAN THOMPSON.

Term expires January, 1913.

J. PIERPONT MORGAN, GEORGE W. PERKINS,
FRANCIS LYNDE STETSON.

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THE FLOWER EXHIBITION.

The Summer Exhibition of The Horticultural Society of New York was held on June 4 and 5, in coöperation with the New York Botanical Garden, in the Museum Building. The west end of the basement hall, in which is located the collection of fossil plants, was filled with plants and flowers. Owing to the cool weather which prevailed the week before the exhibition, a large exhibit was not expected, but the result was contrary to expectations, the amount of plants and flowers entered for competition being greater than the facilities for their display. The place allotted to the exhibition was crowded with material, enough in fact to have filled the entire hall.

The exhibition opened on Saturday at two in the afternoon, and continued open the following day from ten until five. The attendance on Saturday was large, greater than at any previous flower exhibition held at the Garden. The visitors were largely flower-lovers, for they spent much time in examining individual flowers and passing intelligent comment on them. At four there was a lecture in the lecture-hall by Dr. N. L. Britton on "Summer Flowers," illustrated with colored lantern-slides. At the conclusion of the lecture an opportunity was afforded to visit the court of the conservatories, under guidance, to see the large American century plant which was sending up its stout flowering stalk or "pole."

On Sunday, although the weather was threatening, ending in a downpour at closing time, the attendance was still larger than on

Saturday. Had the weather been fine there would undoubtedly have been a large crowd present. The opening of these exhibitions on Sunday is certainly appreciated.

The premiums were offered by the Garden, to be awarded by the exhibition committee of the council of The Horticultural Society of New York. These were for peonies, hardy roses, flowering shrubs and trees, hardy rhododendrons and azaleas, herbaceous plants, irises, and orchids. The peony was the flower most in evidence, and the display was a fine one, in spite of the cool weather which interfered with their proper development. Mr. Geo. H. Peterson took the first prize in most of the classes, including that for the largest and finest collection. His exhibit in this class was a feature of the exhibition, occupying the entire west end of the exhibition hall. The first prize for the best collection of single peonies went to Mr. T. A. Havemeyer, Albert Lahodny, gardener.

The cool weather preceding the exhibition retarded the development of roses, so that few were sent. The first prize for the best collection of hardy roses went to Mrs. F. A. Constable, James Stuart, gardener, the second going to the F. R. Pierson Co. The first prize for the best collection of hardy flowering shrubs and trees was awarded to Mr. E. H. Weatherbee, Francis Milne, gardener, the second prize going to Mr. T. A. Havemeyer. Mr. Havemeyer also took the first prize for the best collection of hardy rhododendrons and azaleas, the second going to the F. R. Pierson Co. The first prize for the best collection of hardy herbaceous plants was secured by Bobbink & Atkins, the second being taken by Mr. E. H. Weatherbee. The same firm also took the first prize for irises, the second going to Mr. T. A. Havemeyer. For the best six orchid plants in bloom, Mr. Clement Moore took first prize, while the first prize for the best collection of cut orchids went to Mr. J. A. Manda.

For an excellent display of campanulas and sweet peas, a special prize was awarded to Miss Blanche Potter, George Wittlinger, gardener. A special prize was also awarded to Mrs. J. B. Trevor, Howard Nichols, gardener, for a collection of twelve early vegetables.

These flower exhibitions are becoming more and more popular, manifesting an increased interest in horticulture. It is hoped that at future exhibitions the amateur gardener will take a more active interest. It is planned to arrange the next schedule of premiums so that the amateur may feel tempted to enter more into the competition.

GEORGE V. NASH.

THE PRESERVATION OF OUR WILD FLOWERS.*

On a beautiful spring morning we wander into the woods, to forget for a while, if possible, the trials and battles of life, and to receive new faith and new hope from nature's heart. Suddenly the serene silence of the early morning is broken by a child's silvery voice, without much volume, but with a sweetness that the greatest opera singer can never equal. Hastening toward the spot, whence the sound arose, we catch parts of a simple little song. Passing under an arch, formed by two young saplings, we stop instantly, for before us is a picture, whose equal the greatest artist can never produce upon his canvas. A baby girl bending to the ground, plucks with her tiny hands a lady slipper, and raising it to her ruddy lips, she kisses it. The sunbeams, penetrating through the leafy bower, play and dance upon her golden hair; the robins are not afraid to approach and sing to her. The purple-winged butterflies alight on her chubby arms, and the bumble-bee, even when she plucks the pink lady slipper upon which it has just alighted, does not desire to harm her with its deadly sting. Can we think of anything more beautiful, more sacred than this little child wandering far away from civilization, in a world entirely her own, raising a wild flower to her lips and kissing it? The wild flower, growing alone in the wilderness, exposed to the violence and extremes of the elements, with no caretaker but God himself, is a message direct from heaven to those who love wild flowers.

I think the wild flowers ought to be preserved. Any person

*Awarded a third prize, competition of 1909, from the Caroline and Olivia Phelps Stokes fund for the Preservation of Native Plants.

who does not love or admire wild flowers is lacking in refinement and culture.

Many poets have expressed their admiration and love of wild flowers in such beautiful sentiments as Lowell has in his poem "To the Dandelion," a flower regarded by most people as the meanest wild flower:

"Dear common flower, that grow'st beside the way,
Fringing the dusty road with harmless gold,
First pledge of blithesome May,
Which children pluck; and, full of pride, uphold,
High-hearted buccaneers, o'er-joyed that they
An Eldorado in the grass have found,
Which not the rich earth's amble round
May match in wealth—thou art more dear to me
Than all the prouder Summer-blooms may be."

Surely we ought to take at least enough interest in them to put forth our best efforts for their preservation. The best way to accomplish this is to get a large number of people in a certain community interested in this movement, and they in turn will interest their friends, till in time everybody will hold a wild flower as sacred as the Jews hold the dogs that lounge about the streets of Jerusalem.

Do we ever stop and imagine what a blessing a bunch of sweet-smelling wild flowers would be on a sweltering hot day to those wretched souls who are compelled to live or work in the tenements on the lower east side? What pleasure would a few "baby" orchids cradling at their hearts the tiny images of infants in long robes, afford, or even field daisies, of which Chaucer quaintly says:

"Of all the flowers in the mede,
Than love I most the flowers white and rede,
Soch that men callen daisies in our toun."

In some cases these poor people have never seen a blade of grass grow. Imagine what their joy and enthusiasm would be if some good Samaritan should burst in upon them and present each with a bunch of orchids whose fragrance would for a short time counteract the disgusting odor of the sweat shops. Here in these wild flowers is an opportunity to realize God's beauty, without depriving them of their hard-earned money, which is so

necessary to sustain their lives. Lowell so admirably expressed this thought when he addressed the dandelion in the following words:

"Tis the Spring's largess, which she scatters now
To rich and poor alike, with lavish hand,
Though most hearts never understand
To take it at God's value, but pass by
The offered wealth with unrewarded eye."

Then, too, wild flowers cover up barren spots in the field and woods and help to beautify places which would otherwise be eye-sores to passers-by. Some plants, such as those of the American ivy or the Virginia creeper, cling to barren rocks by means of a number of stout little "suckers," but if no rock or wall be near, the "suckers" turn into delicate tendrils, which clasp bough and twigs, and this vine adapts itself to any station in life and makes the utmost of its opportunities.

Further, a great amount of the honey which most people regard as the most delicious delicacy comes indirectly from the wild flowers. The bee and the wild flower form a sort of mutual-benefit society. The sweet scents of the conspicuous corollas of the wild flowers may be regarded as advertisements to catch the attention of the passing insect and to tell it of the presence of nectar. Professor Gray expresses this system in the following humorous manner: "Where free lunches are provided, some advantage is generally expected from the treat." The bumble-bee, flying from flower to flower, gets its velvety body sprinkled thickly with golden dust. In extracting the nectar which lies deep down in the long tubes, it crawls all over the blossom head and some of the pollen, which had clung to its breast and legs, is sure to be left on the stigmas of the flower. It has also brushed against the anthers, and has taken a fresh supply of the yellow powder, with which it will fly to another flower head. Thus it carries on the process of cross pollination, which is so necessary for the maturing of all flowers, and takes in return the sweet nectar, which it carries to the hive for food. In order to preserve our wild flowers, it is very urgent that we take care lest these useful bees become unable to carry on their important work. In this connection it might be well to examine the rather curious

demonstration of Huxley concerning the crop of red clover in a certain section of country. He has proved that there is a direct ratio between the quantity of red clover in any given section, and the number of old maids residing in that section. His demonstration is as follows: Old maids keep cats; cats are enemies of the field mouse; these mice in turn are the foes of the bumble-bee, for they devour the little store of honey, which the thrifty insect lays by for its winter sustenance. Bumble-bees are the pollen-carriers of the red clover. Hence, the more old maids there are in a region, the more plentifully it is stocked with cats; the fewer therefore are the field mice; the greater is the number of the bumble-bees, and the more abundant in consequence is the crop of red clover.

Some wild flowers are very wonderful in their construction, accomplishing feats which, if universally known, would be considered even more marvelous than our newest machines. There are many insects which eat wild plants and thus destroy the friends of the botanist. The harassed scientist wages ceaseless war upon them all summer, but all in vain. One can imagine what comfort the thought brings to his sorely tried soul that there are plants in the world which avenge their fellow plants and turn the tables by eating insects. The commonest and most wonderful of the ogre-flowers is the little sundew, which Darwin admired so much that he thought it a worthy object for long and patient study. This plant is found in wet sandy spots. The leaves are round and long-stalked, pressed flat in a rosette against the ground, and rather a reddish color at the first casual glance. A stem bending downward at the tip bears a number of buds and one white flower. As they wave with the wind they certainly do not look very bloodthirsty or even mischievous. Upon examining the leaves closely one finds that their surface is really green after all. They appear red at first, because they are covered with living movable sticky hairs, each tipped by a ruby-colored gland scarcely as large as a pinhead. When an insect lights on the leaf, attracted by the bright red glands with their honey-like gum, he becomes clogged by the sticky hairs and cannot drag himself free, for all his frantic efforts. The hairs

bend toward the prisoner till their glands touch his body, reaching after him from all sides. A few moments later, the leaf itself rolls up and encloses the captive. The more the fly struggles, the more it excites the living hairs to grasp it, while the sticky fluid pours from the red glands till the little legs and wings are so tied and plastered down that they can strive no longer. The gum stops up the tiny holes in the insects sides through which it breathes, and it soon dies, strangled and exhausted. After the insect has been lured, secured and killed, the next thing in order is the banquet. The fluid, which has all this time been flowing from the ruby glands, continues to flow, but becomes somewhat changed in its nature. Chemists who have examined the fluid at this point have found that it is very similar to pepsin and it dissolves the sundew's dinner just as the pepsin in the human stomach dissolves what has been swallowed in the last meal. If one places a grain of sand or a little bit of wood on the leaf, the glands bend over it at first, but soon find out their mistake and let go again. Darwin experimented on the leaves with tiny scraps of raw beef, and he found that some which had feasted too heartily suffered apparently the pangs of acute dyspepsia. They changed color, refused all food, grew limp and dejected, and died miserably. Is not this wild flower growing out in the open, with no covering over its frail little head but the blue heavens, more wonderful than any machine ever invented by man?

There are a few wild flowers extremely poisonous in their effects on the majority of persons who come in contact with them; still their number is so insignificant in proportion to all the other flowers that they ought not to prejudice any one against the other wild flowers. Besides, in most cases they can be easily detected from the harmless flowers by some tell-tale detail, as for instance the poision hemlock may be distinguished from some of its harmless cousins by the claret-colored blotches on its large smooth stalks, or by a very offensive "mousy" odor, which its leaves emit when cut or bruised. Our real wild enemy, the poison-ivy, is exceedingly common everywhere. It thrives on rocks, along stone walls, in fence corners, or clambers up tree

trunks, in thickets and moist meadows. The poision-sumach is a near relation to the poision-ivy. It has beautiful rose-purple leaf-stalks. Some persons gather the flowers and foliage of both plants with impunity, while others are badly poisoned by them. Sometimes children who are ignorant of the effects of some poisonous plants, induced by the peculiar feeling they experience upon munching the foliage, enjoy games in which the object is to see who can longest endure the discomfort. There are some plants poisonous to the stomach. Such plants, as fool's parsley, and poison-hemlock, have sickened and killed children, who have eaten their roots, supposing them to be "sweet cicely" or the like. Cattle turned out to pasture in the spring, after being shut up all winter, are liable to eat this plant, and to be seriously injured or even killed by it. As most young children love to gather wild flowers, they should always be cautioned never to taste or handle any flowers with which they are not perfectly familiar. Mother nature warns us against these poisonous plants, in her own way, for they are generally biting, acrid or nauseous to our palates.

After realizing the wonderful life of the wild flowers—and their actions certainly are wonderfully like those of the conscious thinking beings—who can say positively that they are not conscious living beings? Life, after all our nature-study, remains as deep a mystery as ever. Those who try to define it only give it a new name. Are we going to neglect our wild flowers, and allow them to be exterminated before we discover God's secrets in their creation? No, we must preserve our wild flowers.

It is late on an autumn afternoon. An old gray-haired lady is reposing in a big arm chair before an open window. She is gazing far out upon the open meadow, to the woods beyond. How inviting the trees and flowers look to her with their brilliantly colored robes. She is dreaming of the happy days of youth in that far-away time, when she too could go out into the forests and live with the wild flowers. She drops her eyes, and her glance falls upon a vase of fringed gentians, resting on a nearby table, the last message from the woods before the long sleep. She reaches for them, and as she draws them to her she singles out the most beautiful, at the same moment a lone tear

falls upon them. As we pass under the open window, we hear in a soft low voice the following words:

"My childhood's earliest thoughts are linked with thee;
The sight of thee calls back the robin's song,
Who from the dark old tree
Beside the door, sang clearly all day long,
And I, secure in childish piety,
Listen as if I heard an angel sing
With news from heaven,
Which he did bring
Fresh every day to my untainted ears,
When birds and flowers and I were happy peers."

MURVIN A. BECKER.

MORRIS HIGH SCHOOL,
NEW YORK CITY.

NATURE STUDY IN LONDON.

Recognition of the educational value of nature study might at first sight appear to have come almost too late, when by far the larger number of the children of England are now born and brought up in great cities. Nature study in its full educational sense involves a good deal more than visits to museums or indoor lectures, though both may be of great assistance; and many teachers in city schools may well have looked round them rather disconsolately for opportunities of contact with living nature, when the benefits of this kind of training first began to be generally recognized. But great towns are by no means so deficient in natural life as the casual spectacle of their vastness and aridity might suggest. Parks, public gardens and the collections of living birds and animals which are kept in many of them provide fairly ample opportunities for intelligently directed study and observation; and, over and above the plants and animals which are preserved and tended by human care, all such ornamental open spaces, as well as many mere wastes left by the builder, become the asylum of many wild species.

London, though the greatest of all great cities, is strikingly rich in records of wild species which have occurred within its boundaries. It is well provided with gardens and spots of verdure, as great cities go; and its fauna and flora are constantly

reënforced from the abundance of wild life in the fields and woods of the surrounding counties and by the introduction of many strange and accidental visitors through foreign trade. The south-west winds of later summer shed over London the winged seeds of the great purple willow-herb that grows in the Surrey pine woods; and a bunch of bananas sold in a greengrocer's shop in Lambeth or Canning Town may be found to conceal the nest of a West Indian humming bird, or some more formidable tarantula or centipede. Nature is present in London much more widely than is suspected; but she often escapes notice owing to her novel and unsuspected refuges. The sluggard of central London who decides to heed Solomon's admonishment can still go to the ant; but he is a good deal less likely to find it in its ordinary out-door haunts, which we may presume that Solomon had in mind, than among the sugar barrels and wine-flasks of a great pro-vision store.

Apart from rare and exotic additions to its list, London pro-vides considerable opportunities for studying the wild life of our own country. Most British trees, and many wild plants, can be observed and distinguished in London parks; and, though London birds are of fewer distinct kinds than haunt most country-sides, they are very numerous, and their great tameness makes them excellent subjects for observation. Plants, birds, animals and insects also excite a livelier interest among London children than among their country cousins, from their very unfamiliarity and their contrast with their urban surroundings. The London urchin concentrates on his illicit minnow-fishing in park waters all the natural interest in wild life which country boys disperse in a hundred daily occupations. A few summers ago, when the trees in Hyde Park were infested with the caterpillars of the vaporer moth, ragged children came from long distances to collect them, and might be seen at the end of the day in distant streets trying to tempt their captives' fickle appetites with such un-natural delicacies as orange peel.

Though the London child's attempts at pet keeping are often extremely ill-instructed, they spring from a healthy natural in-stinct, which only needs proper education to become of great

assistance in the training of mind and character. Pet keeping has one marked advantage as a means of training, since it makes the child personally responsible for the health of the pet under its charge. But it has numerous difficulties and disadvantages in London life when extended beyond the range of a comparatively small number of creatures that lend themselves kindly to such a relationship. The truest kind of nature study develops an interest in the forms and processes of nature which is no less keen for being devoid of any stimulus of proprietary instinct. In America, where nature study in schools is more highly organized than it is as yet in our own country, it is found that a healthy personal stimulus can be provided by instituting competitions between school forms, or individual scholars, for the earliest or fullest records of observations, and by other such simple devices.

The chief difficulty which at present stands in the way of nature study in English town schools is the lack, not of objects to study, but of qualified persons to instruct. Many school teachers excellently qualified in all that their training has demanded of them are not much more familiar with nature than their pupils; and they have often lost much of that power of observation which children generally possess. The same is true of many other persons who might superintend natural history societies and field classes. However great is their willingness to volunteer, they themselves often need help and instruction before it can bear much practical fruit. Distances are so great an obstacle in London, especially for children, and above all for poor children, that information on the local opportunities for nature study in each district is specially helpful and valuable.

An excellent example has been recently set to other local bodies in the publication under the direction of the Battersea and Wandsworth Educational Council of a skilful little volume entitled "Battersea Park as a Centre for Nature Study." This gives a detailed account of the plants, birds, insects and other phases of nature and wild life which occur in Battersea Park and its neighborhood; but much of its information, as well as the suggestions which it throws out for lines of inquiry and discussion,

would be almost equally applicable to other parts of London. It is largely owing to such concentration of observation on a small and well-defined area as has produced this book that the natural history records of London are so surprisingly rich and so encouraging to all who take up the study of nature within its borders.—*London Times—New York Evening Sun.*

PRESERVATION OF THE WILD FLOWERS.*

All beauty originates in nature. Man cannot create beauty all he can do is to imitate the beautiful in nature. While all in nature is attractive, the smallest and most hidden herb, as well as the tallest and stateliest tree, by far the most beautiful creations of nature are the flowers.

Man has realized the exquisite beauty of the flowers, and therefore grows them in his gardens that they may be nearer to him and he may the better enjoy their charm and fragrance. He has also, by careful cultivation and selection of them, succeeded in producing flowers that are very much improved in color, size and fragrance. Doubtless, when beauty is measured by the standard of form and color, the cultivated flowers surpass their wild prototypes. But does this standard consist of form and color alone? No. The real standard takes into consideration also the sensation of pleasure which the vision of the flower imparts to the individual who beholds it. Taking this into consideration, which, on the average, gives you the greater pleasure, and impresses you as being the more beautiful, the cultivated or the wild flower? Which give you the greater sensation of beauty, the pansies which grow in your garden, or the violets which you discovered while on a pleasant ramble in the woods, sleepily nodding their heads in the gentle breeze blowing through the shaded dale where they grew in great numbers? Which are you more proud to show your friends the pansies or the violets? Which do you enjoy more, a wall

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through a scientifically planned garden with its geometrically designed flower-beds, or a pleasant ramble in the woods and fields of nature with their diversity of irregularly distributed flowers? In fact, it is this very irregularity of the distribution of the flowers which adds one of the greatest charms to nature. Are not the flowers a hundred times more beautiful when we come upon them suddenly, and in the most unexpected places? For

"Beauty is more beautiful when beauty's least expected."

Nature is generous, very generous, and permits all who would to enjoy her beautiful domains; to inhale the fragrance of her odorous flowers, and to feast their eyes on her iridescent hues. Very different from this is the behavior of man. No doubt, should he ever be able to make anything that even approaches in attractiveness the laurel-covered mountains and hillsides of the Alleghanies or the vast fields of golden-rod in October, he would surround it with a ten-foot fence and a double tier of barbed wire to confine its beauties to a few of his select friends.

And how does man show his appreciation of nature's generosity? By selfishly tearing out the most charming flower he finds, and thus, while he does not enjoy its beauty very much longer, deprives others of enjoying it; and, by keeping the plant from producing seed, deprives himself and everybody else of that enjoyment in after years.

There was a time in the history of this country when the handsome pink moccasin flower flourished in great numbers in the deep woods; but a public who, with no thought of the future, picked every specimen it could find, and an immense horde of "orchid hunters" whose minds know only the lust for gold, have so reduced its numbers that, even though each flower that does set seed produces upward of a million seeds, it is now extremely rare in its wild state, and the discovery of one during a ramble in the woods is considered an event. The blue gentian is another case. Once so common, it is now rare in its native haunts. Greedy street venders who ruthlessly tear up the plant by the yard, and the public without even the excuse of eking out a paltry income by its sale, have rendered the fragrant,

trailing arbutus a rarity, and have altogether exterminated it in the vicinities of our eastern cities. The pretty cardinal flower is another victim; and still another, and the last one I will discuss here, is the charming arethusa, which is doomed to total extinction in its wild state, because of the relentless war being waged against it by the "orchid hunters" who sell its bulbs.

I have given you but an inkling of the destruction of our most beautiful wild flowers by an ignorant public and a gold-greedy class of flower venders, for fear that, should I attempt to portray to you anything like the real condition of affairs, I would soon tire you. Let it suffice to say that there are hardly any wild flowers, excepting the weeds, which have not suffered from these causes. How curious that the majority of the people show their appreciation of a flower's charm by selfishly and ignorantly tearing it out!

For years and years this wanton destruction of the most beautiful in nature has been going on without any signs of its ever abating. Must then the wild flowers be exterminated, as needs must happen if things continue in their present course, and without a dissenting voice? True, every now and then somebody in a position to know warned the nation of the inevitable extermination of the wild flowers, but he was quickly put down with cries of "pessimist." Of late, however, there has been growing a sentiment that the wild flowers ought to be saved; and, while it is yet too small to accomplish much, it is bound to grow and grow until it has accomplished its purpose and our most beautiful wild flowers have been saved.

It is very well to say the wild flowers must be saved, but how? Before we attempt to consider the remedy, let us first discover the causes. One of the chief causes of the disappearance of the wild flowers is the class of people who depend on the money they can secure from the sale of those that they pick for their livelihood. Perhaps the best and only measure that can be used in this case is the enactment of a law forbidding the picking of wild flowers for business purposes. It has been urged against the possible enactment of such a law that it would deprive a multitude of men of their means of earning a livelihood;

but, as the flower market must be supplied, there will arise a greater demand for hot-house flowers and this will mean an increase in the number of hot-house employees that will more than offset the loss of employment caused by the enactment of such a law.

The other, and more difficult cause to combat, is the picking of the flowers by the public wherever and whenever they find them. These people can be divided into several groups. First come those who pick the wild flowers just for the fun of picking them. They do not take them home, nor do they enjoy them much when they pick them. They throw them away. I have often seen a field of buttercups crossed by a path where somebody who had gone through a short time before had torn off every flower he could conveniently reach without going off his path, evidently just for the fun of it, for the buttercups were all lying about where he had cast them away as soon as he had picked them. A person who did this to buttercups would not hesitate to do the same to every other wild flower he came across. The only measure that would help in such a case is the education of the culprit as to the damage he is doing when he thoughtlessly tears out the flowers in this way; for nobody would do this intentionally.

Second are those who, in the case of perennials, are not satisfied with the flower alone, but tear out the roots and stem also. A good example of this is the damage done to trailing arbutus. Jack-in-the-pulpits, although still quite abundant, are evidently on the decline because people, not satisfied with the flower, insist on taking the corm also. As in the previous case, about the only measure that can be used here is the education of the people who do it, so that they will realize the damage they are doing.

The last class includes those who pick the flowers because they love them. They do not realize the damage they are doing. They appreciate the charm of the flowers and therefore, when they come upon an attractive specimen, they do not hesitate to pick it. Perhaps they think, "Here is a beautiful flower. In a few days it will wither and be beautiful no longer; then why should we not pick it and enjoy it for the rest of its short life? We are not robbing the world of so very much. This is but a small speck on the

surface of the earth and it does not matter much whether we pick it or not as there are so many others in the world." But most probably they are so accustomed to pick a flower when they find it growing wild, that they do not think at all.

The only way we have of fighting the indiscriminate picking of wild flowers is by educating the public. Nearly every person in this country reads some newspaper or periodical, and if we could get the owners and editors of these interested in the subject, we would have taken a great step towards the end in view.

But our greatest hope lies in the schools, where we of the present are moulding the future. As things now are in the schools the outlook for the future of the wild flowers is extremely dark. There is at present too little nature study in the curriculums of our schools, and that more of a mechanical nature than it should be. It is very well for the child to know the functions of the different parts of the plant, and the like, but, before we teach him this we should teach him the true beauty of the wild flowers, and the importance of not picking too many of the flowers he finds growing wild. At present the child is taught nothing of the kind. During my many years at school I never heard a teacher say a word about the necessity of preserving the wild flowers. It is not because they are not aware of the disappearance of the flowers—as I have often heard them speak about that. The general trend of their thoughts seems to be that because the more beautiful wild flowers are disappearing, we should pick them whenever we find them before they have altogether disappeared, if we want to get our "share." They, like many others, while aware of the disappearance of the flowers, and conscious that every specimen they pick helps to hasten their disappearance, have given up the hope of saving them and have resolved that, while they do last, they are going to "get their share" of them. They seem to think, "If all the flowers are going to be picked anyway, then why should I not pick them?" If these people should see that a concerted effort is being made to save the fast disappearing flowers, they would, doubtless, join in it. And if we thus interest the teachers in the subject, we have secured the schools,

and if we have secured the schools we have saved the fast disappearing wild flowers.

In short, we must teach the public the havoc they do when they indiscriminately pick all the beautiful wild flowers they find. We must instill new hope into those who have lost all hope of saving the flowers. We must imbue the public with a judicious sense of foresight; to let the very rare wild flowers flourish and set seed in peace; to discreetly pick only a few of the moderately rare ones; and of the abundant, prolific ones to pick all they may desire. We should not desire to prohibit the public from picking all wild flowers; but we can and must stop that indiscriminate, wasteful, picking which has so decimated the numbers of our most beautiful plants.

Though some think that forbidding this picking for business purposes would be sufficient to effect our purpose, we cannot decide whether or not, until it has been tried. And until it has been tried we can set on foot the educational movement. It can do no harm, and it can do immense good. Let everybody, therefore, work for the preservation of not only the fast disappearing wild flowers, but also of everything else in nature. It is a debt we owe to our more ignorant brothers and sisters. Let everybody imbue his friends with the spirit of preservation, and let his friends do the same to their friends, and in this way let the good work continue till ignorance is no more and, when asked,

"Hast thou named all the birds without a gun?
Loved the wood-rose and left it on its stalk?"

all will be able to answer "YES."

MORRIS A. RAINES.

MORRIS HIGH SCHOOL,
NEW YORK CITY.

NOTES, NEWS AND COMMENT.

At the summer meeting of the Vermont Botanical Club held at Woodstock, Vermont, July 4, 5, and 6, Dr. N. L. Britton delivered a public lecture in the Woodstock Opera House on the evening of July 5, illustrated by colored lantern-slides of wild flowers from the Van Brunt Collection of the Garden. The

meeting of the Vermont Botanical Club, in which the Vermont Bird Club coöperated, was a very successful and enjoyable occasion, and was made so, largely by the hospitality of Professor and Mrs. Frederic S. Lee, and Miss Elizabeth Billings. Many interesting plants were observed. About fifty persons attended.

Prof. David R. Sumstine, of the Pittsburgh High School, has been awarded a scholarship at the Garden for the month of July. Mr. Sumstine is engaged in a systematic study of certain groups of the lower fungi.

Dr. William J. Gies, consulting chemist of the New York Botanical Garden, will conduct investigations of various species of poisonous fungi during the coming year.

Leaf-blight of the plane-tree (*Glæosporium nervisequum*) was very conspicuous this season on the grounds of the Garden from the middle of May to the end of June, the continued rainy weather being especially favorable to the development of the fungus. This severe attack, following so closely the epidemics of 1907 and 1908, will undoubtedly kill or severely injure many of the smaller branches of the plane-trees in this region.

Mr. H. S. Jackson, research scholar at the Garden in 1907, has been appointed professor of botany and plant pathology in the Oregon Agricultural College. Mr. Jackson has been, since August, 1909, research assistant in plant pathology in the Oregon Agricultural Experiment Station.

Bulletin 118 of the Bureau of Plant Industry, United States Department of Agriculture, contains the results of four years of research in "Culture Studies of *Penicillium*" by Dr. Charles Thom, mycologist in cheese investigation. Twenty-seven species and three varieties are described in this paper. In addition to the morphological characters, the physiological effects upon nutrient media have been found to be reliable characters in separating some species and in such cases are introduced into the diagnosis of the species. The work is illustrated by thirty-six figures.

Mr. Harlan H. York, of Johns Hopkins University, Baltimore, recently visited the Garden on his return from Jamaica, West

Indies, to New York. Mr. York will spend about six weeks at the laboratory of the Brooklyn Institute of Arts and Sciences located at Cold Spring Harbor, Long Island.

Dr. W. A. Murrill, assistant director, recently returned from Virginia with a collection of poisonous fungi, which will be chiefly used for chemical analysis. Returning, he found evidences of the chestnut canker not far from Baltimore, Maryland, and diseased trees became more abundant northward. At Belair, Maryland, seventy-five miles south of Philadelphia, and at Northeast, Maryland, the effects of the canker were very noticeable, most of the chestnut trees being dead or in a dying condition. At Red Bank, New Jersey, where the first chestnut trees were observed near the coast, the disease had become very serious and was noticed from this point all the way to New York City, especially near South Amboy, New Jersey, where whole forests were either killed or badly affected. Throughout the whole of Staten Island, not a single healthy chestnut tree was observed.

Dr. J. E. Kirkwood, research scholar at the Garden at various times from 1899 to 1904, has been appointed professor of botany and forestry at the University of Montana.

Meteorology for June.—The total precipitation for the month was 4.84 inches. Maximum temperatures were recorded of 72° on the 4th, 79° on the 8th, 89° on the 14th, 95° on the 23d and 93° on the 30th. Also minimum temperatures were recorded of 44.5° on the 5th, 49° on the 8th, 57° on the 14th, 54° on the 26th and 60° on the 29th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

76 specimens of flowering plants from British America. (By exchange with the Geological Survey of Canada.)

418 specimens of flowering plants and ferns from the Philippine Islands. (Distributed by Prof. A. D. E. Elmer.)

2 specimens of *Dryopteris simulata* from New York. (Given by Mr. R. C. Benedict.)

8 specimens of hepatics from Connecticut. (Given by Miss Annie Lorenz.)

6 specimens of North American ferns. (Given by Miss Margaret Slosson.)

1 photograph of *Hecistopteris Werckleana.* (Given by Prince Roland Bonaparte.)

150 specimens of flowering plants from Texas. (By exchange with the Field Museum of Natural History.)

121 specimens of lichens, hepatics, mosses and ferns from Mexico. (Collected by Dr. and Mrs. W. A. Murrill.)

22 specimens of *Crataegus* from Cooper Plains, New York. (By exchange with Mr. G. D. Cornell.)

11 specimens of *Crataegus* from the northeastern United States. (Given by Mr. E. P. Bicknell.)

1 specimen of *Aytonia Evansii* from Jamaica. (Given by Dr. A. W. Evans.)

20 specimens "American Hepaticae," Decades 5 and 6. (Given by Miss Caroline C. Haynes.)

135 specimens "Mycotheca brasiliensis," Century 1, and appendix. (Distributed by Dr. Ernst Ule.)

7 specimens of *Dicranella*. (By exchange with Dr. Harold Lindberg.)

6 specimens of *Leucoloma*. (By exchange with Dr. V. F. Brotherus.)

12 specimens of mosses from Arizona. (By exchange with Mr. L. N. Goodding.)

740 specimens from New York, New Jersey and Pennsylvania. (Collected by Mr. Norman Taylor.)

PLANTS AND SEEDS.

1 plant of *Nidularium striatum*. (By exchange with Mr. A. J. Manda.)

40 rhododendrons. (By exchange with Department of Parks, Borough of Bronx.)

3 cacti from Cuba. (Given by Hermano Leon.)

8 hardy ferns. (Given by Mr. K. C. Benedict.)

4 plants for hardy collections and conservatories. (By exchange with Buffalo Botanic Garden.)

3 cactus plants from Gonzales, Mex. (Collected by Dr. H. H. Rusby.)

21 plants for the conservatories, from Mexico, Texas and Nevada. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

1 *Sedum*. (Given by Mr. F. L. Stetson.)

170 plants derived from seeds from various sources.

8 packets Mexican seed. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

1 packet seed of *Geonoma Swartzii*. (By exchange with Public Gardens, Jamaica, W. I.)

5 packets New Mexican seed. (By exchange with Prof. E. O. Wooton.)

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JOURNAL

OF

The New York Botanical Garden

EDITOR

PERCY WILSON

Docent

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JOURNAL

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The New York Botanical Garden

VOL. XI August, 1910. No. 128.

DOCENTRY.

For several years a system of personal guidance of visitors applying for such attention has been in practice at the New York Botanical Garden, in Bronx Park. Aids and gardeners from time to time have been detailed for this work, and the results have been such that the board of managers has authorized the director-in-chief to amplify it through the appointment of an officer known as a docent, and to concentrate the work in his hands. Dr. N. L. Britton has appointed Percy Wilson to the position. The docent has served for a time as administrative assistant to the director-in-chief. A recent afternoon with the docent was passed in considering the pinetum, a collection of cone-bearing trees, and their botanical allies. The hardy species of this collection are mostly planted in the southwestern portion of the Garden, surrounding the great public conservatory range no. 1, and extending to the museum approach, the herbaceous grounds, and the economic garden. So they are spread over thirty acres or more. Most of the trees as yet are small, as but little of the planting is more than ten years old; they have been obtained from time to time from a variety of sources, but the greater number were presented to the Garden by Lowell M. Palmer, a member of the corporation.

The trip began at the northern end of the glade occupied by the economic garden. Here was seen the Japanese cedar (*Cryptomeria*), planted here in the lee of the woods for protection from cold winds. One of the trees is bearing its small round characteristic cones; in its native home in eastern Asia it forms

a gigantic tree and its lumber is highly prized. Near-by is a group of the so-called umbrella pine (*Sciadopitys*), also Japanese in origin, its common name taken from the peculiar clustering of its long narrow leaves. This is one of the most decorative of evergreen trees, growing more than a hundred feet high, and has been cultivated around Japanese temples for ages.

The true cedars (genus *Cedrus*) are represented by the deodar, native of the Himalayas, and by the Mount Atlas cedar, of northern Africa, both gigantic trees in their native habitats. Passing south along the ridge, visitors find fine young trees of the curious and beautiful golden larch (*Pseudolarix*) of China; like the larches this species loses its leaves in the autumn, but, unlike them, its cones fall into pieces, while still on the tree. The real larches are exemplified by several species near-by. The eastern American kind, tamarack, or hackmatack, which forms bog forests further north, is represented by a few wild trees in the northern part of the Garden.

Yews, relatives of the cone-bearing trees, but producing a pulpy fruit are clustered on a slope just east of the larches; the Japanese species grow most vigorously in this latitude, and several horticultural varieties of it and of the English yew are in the collection. Passing next to the pines, one finds a splendid group of the cunning little Tyrolese Mountain pine; south of the larches and near-by several species of the white pine group, all most important timber trees; the Japanese red pine, and the North American Banks' pine are planted near the main driveway on one side, and the Austrian pine and Scotch pine on the other side; a number of other pines are to be seen on the hills east and northeast of the large greenhouses.

The docent points out the differences in foliage, and in cones of these trees. Then he leads the way to the spruces and firs. The cones of spruces are pendulous on the branches; those of firs are upright.

The hemlock spruces (genus *Tsuga*, a name taken from the Japanese for the typical species) are planted near the elevated railway approach. The docent reminds his pupils of the famous natural forest of the Canadian hemlock spruce on the hills bor-

dering the Bronx River within the garden. The Douglas spruce (*Pseudotsuga*) is represented by a group of fine young trees opposite the elevated railway entrance. These bear long cones with bracts projecting beyond the scales, but they are not fruiting this season.

To the west and south of the great glass house are the arborvitaes (*Thuja*) and the Asiatic retinisporas in great variety, and succeeding them many species of junipers (*Juniperus*). The red cedar (*J. virginiana*) is plentifully wild in many parts of the grounds. The white cedar, so abundant in swamps from New Jersey southward, is planted for protection from cold in a swale near the Southern Boulevard entrance, and the two kinds of bald cypress, native only as far north as New Jersey, occupy another swale across the driveways. Both these depressions are on the site of an old marsh, reclaimed by grading operations several years ago. The swing of the visitors around this coniferous circle ends on the ridge at the south end of the herbaceous garden, where they admired a group of the curious maidenhair tree (*Ginkgo*), native of eastern Asia, its common name is given with reference to its peculiar leaves, which are somewhat like the leaflets of some tropical maidenhair ferns (*Adiantum*). Ginkgo produces a pulpy fruit somewhat like that of the yews, but much larger, and is an interesting relative of the conifers, now naturally restricted to eastern Asia, but in former geological epochs of wide geographical distribution, as shown by its leaves found as fossils in Europe and in North America. On the way back to the railway station the party stops at houses no. 12 and 13 of the great glass house to view the collection of Norfolk Island pines (*Araucaria*), natives of the southern Pacific Islands and of South America, but in former geological time extending north, at least as far as New Jersey, as shown by fossils in the Amboy Clays, studied by Professors Hollick and Jeffrey, and recently described by them in a memoir of the New York Botanical Garden. Here are also many other beautiful conifers not hardy in this latitude, as well as specimen plants of the bizarre leafless joint firs (*Ephedra*), outlying relatives, natives of dry and desert countries, and in house no. 1, the cycads, or sago-palms, tropical relatives.

The docent has a vast deal of information at his command—botanical, horticultural, and economic. He points out the careful mulching of the young conifers with leaf-mould, to conserve moisture and furnish plant food, this leaf-mould being obtained from leaves raked from lawns every year and rotted in large piles in an out-of-the-way place along the Bronx River. He tells how, under the microscope, the wood of coniferous trees can readily be told from that of hardwoods, and by expert knowledge the different coniferous woods distinguished from each other. He touched on the manifold useful products of these trees, other than lumber, such as turpentines, oils, pitch and balsam, tanbark from the hemlock spruces, and edible seeds from many of the pines; on the conservation of coniferous forests, and reforestation of denuded countries; on the relative rapidity of growth; and on the kinds best adapted for decorative planting.

The present arrangements are for the docent to leave the front door of the museum building every week-day afternoon at three o'clock, and his routes are as follows: Mondays, herbaceous garden, economic garden, hemlock forest and valley of the Bronx; Tuesdays, pinetum and part of public conservatories no. 1; Wednesdays, fruticetum and north meadows, including the collection of willows; Thursdays, deciduous arboretum, nurseries, propagating houses, and public conservatories no. 2; Fridays, public conservatories no. 1 and flower gardens; Saturdays, museums, library, herbarium and a public lecture at four o'clock for those who care to attend it.—*New York Evening Post.*

THE BROOKLYN BOTANIC GARDEN.

On the twenty-eighth of December, 1909, Mayor McClellan, on behalf of New York City, and the president and the treasurer of the board of trustees of the Brooklyn Institute of Arts and Sciences, on behalf of the institute, signed an agreement for the establishment of a botanic garden and arboretum in the borough of Brooklyn. For this purpose there has been reserved a tract of land, comprising between thirty-five and forty acres, lying

south of the Museum Building of the Brooklyn Institute on Eastern Parkway, between Washington Avenue on the east, and Flatbush Avenue on the west. The southern limit coincides with the boundary between the old town of Flatbush and the old city of Brooklyn. This is an area of well diversified topography, and will lend itself most admirably to the purpose in hand.

The city of New York has appropriated the sum of one hundred thousand dollars toward the erection of a laboratory building and greenhouses, and public-spirited citizens of Brooklyn have contributed fifty thousand dollars additional, the interest of which may be used for equipment. The erection of a laboratory building and greenhouses will be commenced as soon as the necessary arrangements therefor can be completed. No scientific staff will be assembled before 1911.

While the promoters of this garden recognize the importance of research, it is the plan to devote more attention to formal botanical instruction than is usually done by botanical gardens. Classes will eventually be organized in all grades of instruction, including both beginning and advanced courses, and the intention and hope is to make the garden as helpful as possible to the botanical work in the public and private schools of the city.

The plans of the laboratory building include offices of administration, class rooms, a large lecture room, a library, laboratories for class use and for research, and several private rooms for investigators.

A range of ten greenhouses is planned, two of which will be directly connected with the laboratory for plant physiology, and be reserved entirely for research. The other greenhouses will be open to the public.

In view of the magnificent opportunites afforded at the New York Botanical Garden, in the Bronx Borough, no attempt will be made to develop an herbarium, beyond that necessary to illustrate the local flora, and the energies of the laboratories will be devoted to morphology, physiology, experimental evolution, and related phases of the science.

C. STUART GAGER.

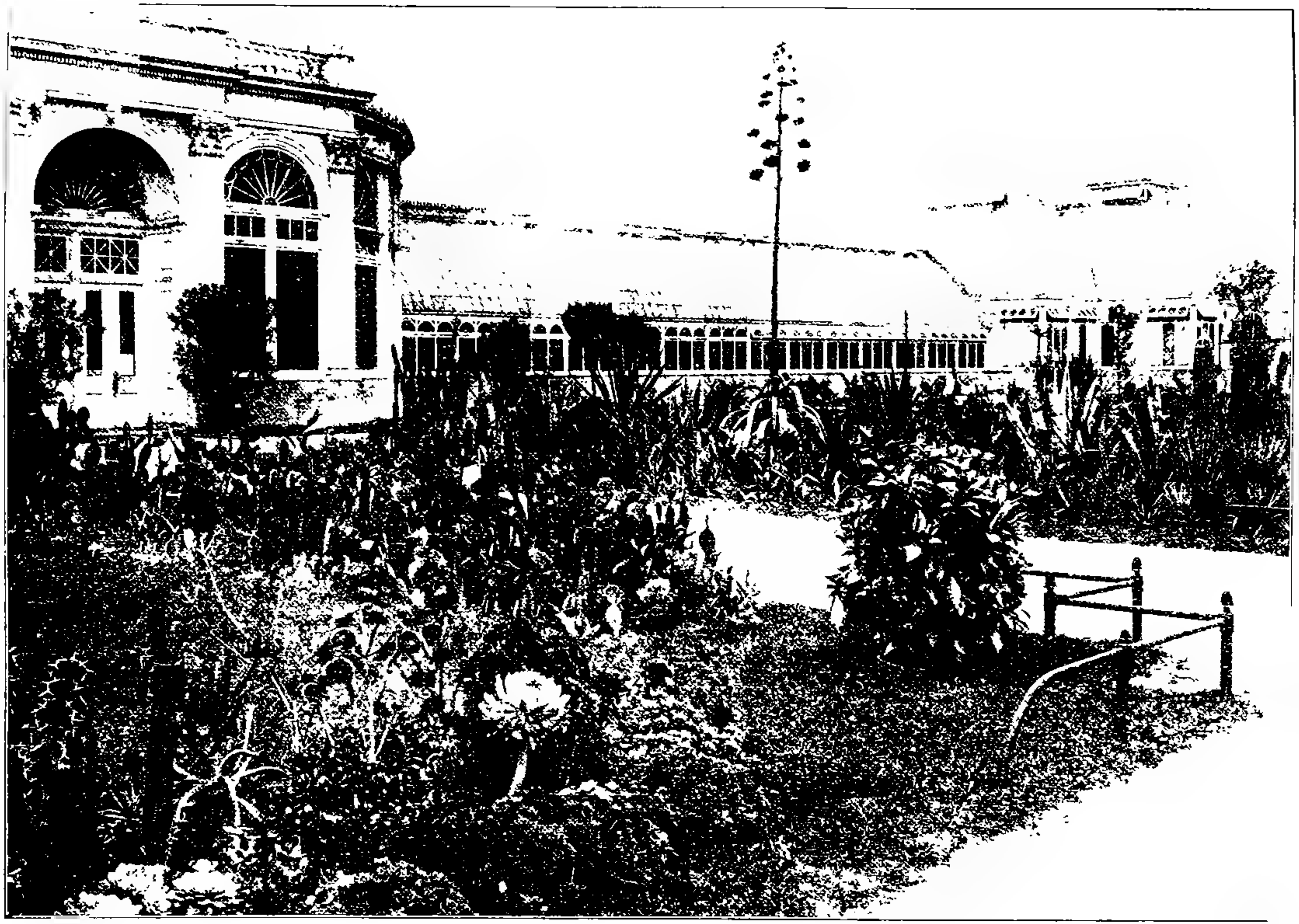
THE COLLECTIONS IN THE CONSERVATORY COURT

Attention has been called before to the collections in the court of conservatory range no. 1, which is located but a short distance from the terminus of the Third Avenue Elevated Railroad. This court is on the south side of the conservatory, and has in either end a large pool fifty by one hundred feet, each devoted to a collection of water lilies, the one to the west containing the tender sorts, while the easterly one is allotted to the hardier kinds, those which remain permanently, both summer and winter, in their present position.

Between these two pools, arranged in five beds, is a large collection of desert plants. These two groups of plants, that of the aquatic world and that of the desert, represent the two extremes in plant environment, and exemplify forcibly how plants can accommodate themselves to conditions so diverse. The water lilies are submerged, their roots embedded in the soil two to three feet below the surface of the water, the only portions exposed to the air being the upper surface of the leaf-blades and the flowers. In great contrast to these are the desert plants in the nearby beds, which, in their native environment, have to contend with a lack of water as marked as its abundance is pronounced in the other case.

As the water supply of desert plants is precarious, they must be provided with means for water-storage to carry them through the long dry spells to which they are subjected. This need is supplied by the thickened stems or leaves, or by large tubers, one of which will be found in all perennial desert plants. Among the members of the cactus family, which form a large part of this collection of desert plants, the thickened stems are the storage organs. In the long narrow bed to the west of the central one is a large collection of the genus *Opuntia*, known often as prickly pears. In some of these the stems are made up of flattened joints which are round, elliptic or oblong, while in others the joints are cylindric. These joints are usually referred to as leaves, but they are not, the leaves of most cacti being very small bodies borne on these joints and soon falling off.

In the large central bed immediately across the path are other



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genera of the cactus family. The tall columnar forms belong to the genus *Cereus* or its near relatives. In house nó. 6 of the conservatories nearby will be found large specimens of a genus closely related to *Cereus*. This is *Carnegiea gigantea*, of Arizona and Sonora, the giant cactus or sahuaro. At the northerly end of this central bed are other cactus forms. Here will be found specimens of the genus *Echinocactus*, the hedgehog-cactus. Two large plants of Gunnison's hedgehog-cactus will at once attract attention with their great armament of yellow spines. There are many other smaller specimens of the same genus. Then there is the Turk's-head cactus, with its crown of red bristles, from which spring the flowers and fruit. In contrast with these are many of the smaller forms, such as belong to the genus often called *Mamillaria*, in which the thickened stem is broken up into smaller elongated bodies arranged around the axis of the plant in usually spiral rows. Some of these are especially attractive in flower or in the equally showy fruit. In this same large bed will also be found plants of the Spanish bayonet, *Yucca aloifolia*; the desert palm, *Neowashingtonia*; and the queer desert plant *Fouquieria*; together with some desert forms of the pine-apple family.

Forming a large part of the central bed is the collection of century plants, members of the genus *Agave*. In these instead of the thickened stems it is the thickened leaves which serve the purpose of storage organs. They too present a great diversity in form but not to so great an extent as the cactus family. The sisal hemp plant will be found here. In this, known as *Agave rigida*, the margins of the leaves are smooth, there being no spines whatever. In other species the marginal spines are large and form an effective armament for the plant. Some form dense rigid rosettes, a condition especially noticeable in Queen Victoria's century plant, while in others the growth is more open, well shown in the largest specimen in the bed, occupying its center. This is the American century plant, *Agave americana*.

A description and illustration of this plant were published in the May number of this JOURNAL. At that time the flowering stem or "pole" was but just making its appearance above the leaves. The illustration accompanying the present article shows

the plant as it is now and offers a striking contrast to its former appearance. The first flowers expanded on the afternoon of July 30, about three months from the time the flowering stem first emerged from the leaves. The plant attained its maximum height, seventeen feet, two and a half inches, on July 12, since which time its growth in that direction has not been appreciable. Late in June it began to make the lateral branches of the inflorescence, and its growth during July has been mainly in that direction, its height increasing but a little over two feet during that time; in June its increase in that direction was nearly five feet.

The two beds already referred to contain only American desert plants. In the long narrow bed to the east of the central bed will be found a collection of desert plants from southern Africa, in which the large genus *Aloe* plays an important part. These plants resemble in habit the century plants already referred to, but belong to the lily family instead of to the amaryllis family. Other interesting plants, also members of the lily family, are species of *Gasteria*, *Apicra*, *Haworthia* and others.

Near this, and placed obliquely to it, is a bed made up of one family, all the plants in it being members of the orpine family, thus showing the distribution of a single family in desert regions in all parts of the world. While in a similar bed opposite, on the other side of the court, is a bed containing desert plants from the Old World only. Especially attractive here are the sempervivums, with their leaves frequently arranged in dense rosettes. The spurges here, with their tall angular stems, will at once suggest the large columnar plants of the genus *Cereus*, already referred to. The resemblance in form is quite striking, although the two belong not only to entirely different parts of the world, but also to widely separated plant families. These tall thick-stemmed spurges are mainly from Africa, while the genus *Cereus*, as well as all other cacti, with a very few exceptions, are strictly natives of the New World.

In the court, placed in various parts as decorative features, are a number of miscellaneous plants. Among these are several acacias from Australia, a fig-tree, hydrangeas, palms, a species of

Doryanthes coming into bloom and much resembling a century plant, and other plants.

It is, however, the two large groups which form the real interest of this court, groups accustomed to widely differing environments. In one of these it is water which plays the important part, and in the other it is the absence of this element. The plants, however, are so nicely adjusted to their environment that each kind thrives in an environment which would be destructive to the other.

GEORGE V. NASH.

CENTURY PLANTS AND SOME OF THEIR USES.

"Doesn't it have flowers till it's a century old? Has this one been here a hundred years? Will any of us live to see it bloom again?"—these and ten thousand like questions are fired daily at the patient attendants near the plot of desert plants in the Bronx Botanical Gardens. For the wondrous century plant presented to the gardens by F. T. Holder in 1901 is now in gorgeous bloom, to the delight of all beholders.

The fifteen-foot stalk with its magnificent clusters of tropical blossoms draws continual crowds to the court of the public conservatories. To get there go to the end of the Third Avenue "L"—and there you are, in the center of Fairyland.

On warm, sunny days the flower stalk sometimes grows three and one-half inches in twenty-four hours, and records of six inches a day are on the books. The blossoms, often as many as a thousand in number, cluster on the short side branches, the lower branches coming into bloom first.

After flowering and seeding, the plants die, but previous to this they send up numerous suckers by which the species is propagated. These plants are often referred to as cacti, a common mistake because of the thick, fleshy leaves, which are spine-tipped, and often armed along the margin with sharp teeth. The century plants are not cacti, but are members of the amaryllis family to which the common garden narcissus and daffodil belong.

Century plants (Agaves) are found wild in deserts or other dry places in continental tropical and sub-tropical America and in the West Indies; in the Spanish-speaking lands they are called "maguey"; in the Lesser Antilles "karata"; in the Bahamas, curiously, "bamboo." Most species are stemless or nearly so, in the ordinary vegetative condition, and of rather slow growth. Two species are native in southern Florida and about twenty in the southwestern States. The American century plant is commonly found in cultivation in many parts of the world, and is said to have been introduced into Europe about 1561. It is probably native of Mexico. A variety of this species, with golden-striped leaves, is also largely grown for ornament. The name "century plant" has been applied to these plants from the mistaken idea that they must be one hundred years old before blooming, a notion probably due to the fact that plants under cultivation in conservatories bloom much later in life than those in their natural surroundings. On the table-lands of Mexico, where century plants are extensively grown, they flower when they are from seven to ten years old.

Century plants have many uses; some species bear thick, fleshy leaves containing a large quantity of strong fiber, which is often removed by beating, after the leaves have been allowed to soak in water until the fleshy parts partly decay. The fiber is then carefully clipped and done up in large bales, when it is shipped away to be made into rope. Sisal or hennequin is the most important of these fibers. Aztec manuscripts were largely written or painted on paper made from the leaves of century plants, and it was long considered equal to the papyrus of Egypt. The leaves of some species are used by the poorer classes of Mexico to thatch their cottages, while a large, fat worm which lives in these leaves is pulled out and enjoyed as a great delicacy by the Indians. Mats, vinegar, molasses and various other articles are also derived from these plants.

Pulque, the national drink of the Mexicans, is obtained from several species of century-plants. At the time when the great flower-clusters are about to be produced, harvesters go through the plantations and cut out the incipient stalks, at the same time

scooping out a sort of basin, into which the sap flows and is collected to the extent of a gallon or more each day for two or three months, or until the plant dies of exhaustion. The sap is drawn from the basin by suction through a long gourd and taken in pig-skins or sheep-skins to the fermenting rooms, where the addition of old pulque converts it into pulque of commerce within twenty-four hours. The product resembles dilute yeast and contains about six per cent. alcohol. If kept longer than a day or two it becomes stale, a fact which the natives fully appreciate. Pulque is sold at three to five cents a quart and is consumed in large quantities by the poor and degraded. Although the percentage of alcohol is low, when taken in quantities the drink is an incentive to crime and idleness. Over 100 car-loads are consumed each day in Mexico City alone. The use of pulque was common among the Aztecs at the time of the Spanish conquest, and it is known that the Aztecs learned its use from the Toltecs, who, according to a legend, owed their downfall to its discovery. Because of the pernicious effects of pulque-drinking among the Indians, several of the Spanish viceroys attempted to prevent its use, but without success.

Mescal, a drink made by distillation from the roots and lower leaves after roasting, is usually not obtained from the same species as pulque, although there is a general belief to the contrary.

The collection of century plants at the New York Botanical Garden is extensive, comprising many rare species, and including a number new to science collected by Dr. Britton and other members of the garden staff in the Bahamas and Cuba; these will soon be technically described by Dr. William Trelease, director of the Missouri Botanical Garden, at St. Louis, who has received duplicates of them from the New York collection. Dr. Trelease has studied the genus *Agave* for many years. One of these new species to science grows only, so far as is known, on Watling's Island, where it was probably seen by Columbus after his landing, but remained unknown botanically until collected there a few years ago by Drs. Britton and Millspaugh.

Some of the Mexican species are quite small plants, and sev-

eral of these have recently flowered at the Bronx, their flower-stalks only two or three feet tall. Two plants of Queen Victoria's agave, a kind with short stiff leaves and quite a tall "pole" have flowered; this species does not die at once after flowering.—*New York Evening Sun*

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NOTES, NEWS AND COMMENT.

Dr John Hendley Barnhart, librarian, returned from Europe, August 1. After leaving Brussels, he visited Munich, Leipsic, Berlin, Paris and London, purchasing books for the Garden library, and studying the collections of bladderworts (Lentibulariaceae) in the botanical gardens of these cities.

We learn from *Science* that "A party from the department of botany of the University of Chicago consisting of Drs. Coulter, Chamberlain and Land and Mr. Brown, will engage in research work in Mexico during September. Dr. Coulter will pay particular attention to the ferns of the Jalapa region, Dr. Chamberlain will continue his studies on Mexican cycads, chiefly in the mountains about Tierra Blanca and Tuxtepec, Dr. Land will collect liverworts in the Tuxtepec region, and Mr. Brown will study cacti.

Miss Winifred J. Robinson, of Vassar College, is in residence at the Garden engaged in studies of the ferns of the Hawaiian Islands.

Prof. W. C. Coker, of the University of North Carolina, spent several weeks at the Garden during July, carrying on further investigations on the flora of the Carolinas.

Prof. A. S. Hitchcock, systematic agrostologist, U. S. Department of Agriculture, is making a trip through Mexico in the interests of his work upon North American grasses. He is visiting, where possible, the type localities of the species of grasses based upon the work of the earlier botanists, such as Humboldt, Haenke, Schiede, Liebmann, Bourgeau and Schaffner, many of which species extend into our southwestern states.—*Science.*

Meteorology for July.—The total precipitation for the month

was 0.64 inch. Maximum temperatures were recorded of 96° on the 8th, 95.5° on the 11th, and 97° on the 24th and 25th. Also minimum temperatures were recorded of 54° on the 6th, 60° on the 15th, and 57° on the 19th and 31st.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

4 specimens of flowering plants from Arkansas. (Given by Professor J. T. Buchholz.)

1 specimen of cones of *Pinus resinosa* from Vermont. (Given by Dr. N. L. Britton.)

3 specimens of *Microthamnium* from Mexico. (By exchange with Mr. Jules Cardot.)

45 specimens of hepatics from Jamaica. (Given by Dr. Alexander W. Evans.)

1 specimen of *Omphalandria linearibracteata* from Cuba. (By exchange with the Field Museum of Natural History)

150 specimens of *Crataegus* from Missouri and South Carolina. (Given by Mr. John Davis.)

3 photographs of *Pinus glabra* from Georgia and South Carolina. (Given by Porfessor W. C. Coker.)

25 specimens for the local herbarium, from Morris County, New Jersey. (Given by Mr. R. C. Benedict.)

43 specimens of young fern plants. (Given by Miss Margaret Slosson.)

30 specimens "Ascomycetes" fasc. 46. (Distributed by Dr. Heinrich Rehm.)

16 specimens of *Aster* from New York. (Given by Professor E. S. Burgess.)

8 specimens for the local herbarium, from Staten Island. (Given by Dr. Arthur Hollick.)

20 specimens for the local herbarium, from Westchester County, New York. (Given by Mrs. C. W. Barnes.)

916 specimens from Idaho, Washington and Oregon. (By exchange with the United States National Museum.)

LIBRARY ACCESSIONS FROM APRIL 1 TO JULY 31.

CANDOLLE, AUGUSTIN PYRAMUS DE. *Prodromus systematis naturalis regni vegetabilis.* Parisiis, 1824–73. 17 vols. in 20. *Index.* Auctore H. W. Buek. Berolini, 1840–74. 4 vols. in 2.

CLARK, GEORGE H., & FLETCHER, JAMES. *Farm weeds of Canada.* Ed. 2. Ottawa, 1909.

GANDOGER, MICHEL. *Novus conspectus florae Europae.* Parisiis, 1910.

KIENITZ-GERLOFF, FELIX. *Botanisch-mikroskopisches Praktikum.* Leipzig, 1910.

LINSBAUER, KARL, LINSBAUER, LUDWIG, & PORTHEIM, LEOPOLD VON. *Wiesner und seine Schule.* (Supplement.) Wien, 1910.

LÖBNER, MAX. *Leitfaden für gärtnerische Pflanzenzüchtung.* Jena, 1909.

MÜTZE, WILHELM. *Rosen und Sommerblumen.* Leipzig, 1910.

PASSON, MAX. *Die Kultur der Baumwollstaude.* Stuttgart, 1910.

RIEHM, EDUARD. *Schädlinge der landwirtschaftlichen Kulturpflanzen.* Berlin, 1910.

RISSO, ANTOINE. *Flore de Nice.* Nice, 1844.

SCHWERTSCHLAGER, JOSEPH. *Die Rosen des südlichen und mittleren Frankenjura.* München, 1910.

SCUDDER, SAMUEL HUBBARD. *Guide to the genera and classification of the North American Orthoptera.* Cambridge, 1897. (Given by the Torrey Botanical Club.)

TILDEN, JOSEPHINE ELIZABETH. *Minnesota algae.* Minneapolis, 1910. (Given by Dr. N. L. Britton.)

TRINKWALTER, L. *Ausserdeutsche Kultur- und Nutzpflanzen.* Leipzig, 1910.

VINCENT, FRANK. *Norsk, Lapp, and Finn.* New York, 1881. (Given by the Author.)

VINCENT, FRANK. *The land of the white elephant.* New York, 1874. (Given by the Author.)

VINCENT, FRANK. *Through and through the tropics.* New York, 1876. (Given by the Author.)

PLANTS AND SEEDS.

29 plants derived from seed from various sources.

2 plants for conservatories. (By exchange with A J. Manda.)

34 plants from Nueva Gerona, Isle of Pines, Cuba. (By exchange with Mr. K. Dahlberg.)

7 plants from Mexico. (Collected by Dr. H. H. Rusby.)

3 seedlings of *Yucca glauca.* (Given by Mr. Frank K. Balthis.)

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Vol. 22, part 1, issued May 22, 1905. Rosales: Podostemonaceae, Crassulaceae, Penthoraceae, Parnassiaceae.

Vol. 22, part 2, issued December 18, 1905. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Hamamelidaceae, Pterostemonaceae, Altingiaceae, Phyllonomaceae.

Vol. 7, part 1, issued Oct. 4, 1906. Ustilaginaceae, Tilletiaceae.

Vol. 7, part 2, issued March 6, 1907. Coleosporiaceae, Uredinaceae, Aecidiaceae (pars).

Vol. 25, part 1, issued August 24, 1907. Geraniaceae, Oxalidaceae, Linaceae, Erythroxylaceae.

Vol. 9, parts 1 and 2, issued December 19, 1907, and March 12, 1908. Polyporaceae.

Vol. 22, part 3, issued June 12, 1908. Grossulariaceae, Platanaceae, Crossosomataceae, Connaraceae, Calycanthaceae, Rosaceae (pars).

Vol. 22, part 4, issued Nov. 20, 1908. Rosaceae (pars).

Vol. 17, part 1, issued June 30, 1909. Typhales—Poales.

Vol. 16, part 1, issued Nov. 6, 1909 Ophioglossales—Filicales.

Vol. 9, part 3, issued Feb. 3, 1910. Boletaceae, Chantereleae, and Lactarieae (pars).

Vol. 25, part 2, issued June 3, 1910. Tropaeolaceae, Balsaminaceae, Limnanthaceae, Koeberliniaceae, Zygophyllaceae, and Malpighiaceae.

Memoirs of the New York Botanical Garden. Price to members of the Garden, $1.00 per volume. To others, $2.00. [Not offered in exchange.]

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with detailed map. 1900.

Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by Dr. Arthur Hollick and Dr. Edward Charles Jeffrey. viii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 278 pp., with 73 figures and 14 plates. 1908.

Contributions from the New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. Five volumes.

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NEW YORK BOTANICAL GARDEN

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JOURNAL

OF

The New York Botanical Garden

EDITOR

PERCY WILSON

Docent

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JOURNAL

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The New York Botanical Garden

VOL. XI. September, 1910. No. 129.

AUTUMN LECTURES, 1910.

Lectures will be delivered in the lecture-hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons at four o'clock, as follows:

September 17, "Orchids, Wild and Cultivated," by Mr. G. V. Nash.

September 24, "The Botanical Gardens of Europe," by Dr. W. A. Murrill.

October 1, "Some Floral and Scenic Features of Jamaica," by Dr. M. A Howe.

October 8, "Carnivorous Plants," by Dr. H. M. Richards.

October 15, "Autumn Flowers," by Dr. N. L. Britton.

October 22, "Plant Diseases and Their Control," by Mr. F. J. Seaver.

October 29, "Explorations in Santo Domingo," by Mr. Norman Taylor.

November 5, "The Flora of Switzerland," by Professor E. S. Burgess.

November 12, "Some Economic Plants of Mexico," by Dr. H. H. Rusby.

November 19, "Cuba: Its Flora and Plant Products," by Dr. N. L. Britton.

The lectures will be illustrated by lantern-slides and otherwise. They will close in time for auditors to take the 5:35 train from the Botanical Garden Station, arriving at Grand Central Station at 6:03 P.M.

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue.

BOTANICAL EXPLORATION IN THE MOUNTAINS OF NORTHEASTERN CUBA.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: Having completed my work of exploration on the cays of the north coast of the Province of Camaguey,* I went to Holguin, Oriente, at the invitation of Mr. and Mrs. Angus Campbell, of the Holguin Fruit Company, to join them in their Thanksgiving dinner. From here I made several excursions into the adjoining palm barrens and low mountain sides to obtain photographs of the peculiar mountain palm, collected in this vicinity the previous season, and also to secure flowers and fruits of a columnar *Cereus*. In the latter I was unsuccessful. While endeavoring to set up my camera in order to photograph a colony of the mountain palm, I discovered a very small *Mamillaria* which was barely protruding through the layer of broken stone that filled the interstices between the larger rocks. The largest of these plants were scarcely an inch in diameter, one of them bearing a small, yellowish flower. This cactus is evidently very rare, only two colonies having been detected after a diligent search by Mr. Campbell and myself. As no species of *Mamillaria* has been reported from the northern side of Cuba, and as it is very distinct from the one you collected on the south side of this province the previous winter, it will probably prove to be a species new to science. A number of other plants not seen on my last trip were also found.

Arriving at Felton December 1, I found that Mr. Jennings S. Cox, Jr., general manager of the Spanish-American Iron Com-

*See Journal N. Y. Bot. Gard. 11: 147–159. 1910.

pany, stationed at Santiago de Cuba, had already sent letters of introduction to Mr. H. C. Reed, superintendent of the Mayari mines, and it is largely due to the many facilities placed at my

FIG. 23. *Rhipsalis Cassutha*, on tree, Woodfred, Oriente, Cuba.

disposal by Mr. Reed, and the assistance rendered by his associates, that my stay in the Nipe region was comfortable as well as profitable.

Felton, the seaport and executive center for the Mayari mines, is situated on a small cay in an arm of Nipe Bay and has the usual limestone formation common to the north coast and apparently the same flora. Little time was spent here other than that required to get my outfit gathered together, which had been shipped to Nuevitas by steamer, and to make arrangements for transportation to Woodfred. The town of Woodfred is situated on the northern edge of the plateau of the Sierra Nipe, at about 1,800 feet altitude, and is connected with Felton by about sixteen miles of standard railroad and two inclined planes, one of these is over 7,000 feet long with several grades, some of which are very steep. At the time of my arrival these were just passing from the constructive to the operative stage. The experience of riding on locomotive tender or cowcatcher or on ore cars or the "barney" of the inclines was novel and at times thrilling, but always a great help and convenience. The railroad constructed to carry iron ore from the foot of the mountains to the seaport traverses the low coastal plain and skirts along the eastern side of Mayari Valley, the latter, with its extensive groves of royal palms and its fertile fields of tobacco and Indian corn, presenting landscape views which equal if they do not excel those of the far-famed Yumuri Valley of Matanzas. The river just as it enters the level plain from the hills of the southeast is crossed by a large steel bridge. Piedra Gorda, at the base of the mountains and at the mouth of the cañon of the Arroyo del Medio, is the terminus of the railroad, and here the extensive system of inclined planes begins.

Excellent quarters were obtained at the Woodfred Inn, where only those having proper introductions are accommodated. This establishment is fitted up with hot and cold shower baths, and the open fire place with its blazing wood fire was a great comfort on damp, cool nights and an unexpected novelty for a tropical country. This also proved to be an important factor in the drying of the collections, as artificial heat was almost constantly necessary. The wide verandas afforded magnificent views of the fertile Mayari Valley with its many small plantations, the rich coastal plain with thousands of acres of sugar-cane of the

Preston estate, and almost the whole of Nipe Bay and northward beyond Satea to the sea; while to the westward Banes can be seen, and the towns of Antilla, Guaba, Preston, Mayari and Felton. The Woodfred Inn, like the offices, cottages, and most other buildings, is constructed entirely of the lumber of *Pinus cubensis*, a hard, yellow pine, felled and sawed on the

FIG. 24. Falls of the Mayari, from bluff on trail from Arroyo Seboruco, Oriente, Cuba.

premises. These trees attain a height of seventy-five feet or more, and are rarely two feet in diameter. Several years ago a number of trees were tapped for turpentine, but it is said that the sap was too thick to flow properly; evidences of this experiment can still be seen along the Bandera trail.

This species of pine forms large forests which cover many acres of the plateau at elevations of from 1,600 to 2,200 feet, a few scattered individuals being found at lower or higher altitudes. As a general statement, it may be said that the pine forests occur

in this region only on the iron ore, an earthy deposit of limonite overlying the mountain rock, which is a kind of serpentine. The surface is always a bright red, but underneath it often passes through various shades of brown to bright ocher-yellow. It is very porous, so that in spite of the frequent rains the pinelands always seem dry, and its pulverulent nature reddens everything coming in contact with it. I understand that steps are being taken to manufacture paint from it, as various shades of red, brown and yellow can be secured by different degrees of calcination. The surface beneath the pine trees is covered either by dry wiry grasses, bracken ferns, or deciduous shrubbery, among which frequently occurs a huckleberry (*Vaccinium*) sometimes becoming tree-like and up to ten feet in height, bearing bright red flowers and dark red or black fruit. A spiny tree-fern and a fan-leaved palm are also found in this formation, but very few deciduous trees grow in the midst of the pinelands; however, on the edges they are often abundant and of large size.

The deciduous woody growth follows rocky streams and the steep hillsides usually bordering them, where an accumulation of humus frequently forms a rich, thick soil. Here one finds a great variety of trees and shrubs with many epiphytic orchids, bromeliads and ferns; also numerous mosses and filmy-ferns. Sphagnum forms small patches in the boggy forest or thicket, especially where a streamlet has its source.

Below the plateau, the steep and much eroded mountain sides are composed of serpentine boulders, rocks and precipices with little or no soil. These are very dry and incapable of retaining much moisture, except near streams. The slopes are covered by a low scrub with very few trees. As a whole, the growth is very dense, often spiny and frequently matted together with vines, or made impenetrable by a woody vine-like grass. A great variety of species occurs in this scrub, but very few are herbaceous. Epiphytic orchids and ferns are also scarce. A fan-leaved palm, different from the one seen among the pines, and apparently of the same species as the so-called mountain palm of Holguin, occurs toward the lower elevations. A species of *Copernicia* is sparingly scattered throughout this formation, which

extends down to an altitude of 300 or 400 feet, below which limestone predominates and a different and more vigorous flora

FIG. 25. Arroyo del Medio, near Woodfred, Oriente, Cuba.

is encountered. There are also limestone hills of higher altitude in the region.

The streams rising in the plateau and flowing northward are

the Arroyo del Medio and Rio Guayabo, tributaries of the lower Mayari. Farther westward is Rio Guava, which flows across the coastal plain into Nipe Bay. On the east side of the plateau are the Rio Seco, Rio Naranja and Rio Piloto, tributaries of the upper Mayari. These rivers usually have their source in many small tributaries which spring from deciduous woods or thickets, and flow over rocky beds entirely devoid of sand, mud or fishes, cutting deeper and deeper as they attain volume. The sparkling clear water, free from mineral substances and said to be almost chemically pure, bounds over boulders and precipices in a continuous chain of rapids and cataracts, and finally takes an immense leap into the deep cañons several hundred feet below. These cañons continue through the foothills. The falls of Rio Guava are plainly visible from the dock at Antilla.

The richest collecting in this region was along these streams. The Arroyo del Medio and the largest of its tributaries, the "Sawmill" Arroyo, were systematically worked from the big falls upward to their sources; most of their branches were also similarly explored. Rio Guayabo was touched at the falls and at several points above, but heavy rains prevented extensive explorations on this stream.

The foothills were worked principally by way of the Piedra Gorda-Woodfred trail. This trail is about five miles long and was opened up by the iron company only a few years ago, preliminary to its operations in the region. Being new and its margins comparatively free from the ravages of fires, so frequent in this section, one gets into the heart of the scrub and can work in and out on either side. The advantage of being able to return to headquarters after a day's work on these rocky hillsides by a ride up the incline, is best appreciated after one has arrived at the foot too late for the last car and is compelled to walk back in the dark. It was along this trail that most of the species peculiar to the foothills were obtained. The Bandera trail, connecting Mayari and San Luis, passes several miles to the westward of Woodfred, but being an old Spanish trail and its margins badly fire-swept, it afforded no good collecting. It was probably on this trail that Charles Wright secured the plants peculiar

to this region that are labeled Mayari, but I doubt if some of these could be found there now.

The deciduous forest, of limited extent, was carefully examined at various points and particular attention was given to a rich tract on the Bandera trail, near the falls of the Guayabo. For shelter here we used a manaca-thatched shack, built and used by the engineers of the iron company in their preliminary work in this region. A tract of woodland near Woodfred which had recently been felled for fuel, but not yet cut into cordwood, afforded an unusual opportunity to collect many rare epiphytic

FIG. 26. Manaca-thatched shack, Bandera Trail, Sierra Nipe, Oriente, Cuba.

plants harbored among the treetops, which are usually difficult to obtain even if observed.

About December 30, Dr. E. A. Schaefer, a friend of my boyhood, recently retired from the drug business, and an officer of the Pittsburg College of Pharmacy, joined me at Woodfred and during the remainder of my stay there was my constant com-

panion, accompanying me on all excursions in all kinds of weather and also assisting with the drying and preservation of the specimens; his collaboration added materially to the results obtained. The first excursion on which he accompanied me served to thoroughly "baptize" him into the work. This was a trip to the peninsula that separates Lebisa and Cabonico Bays. Going down the trail from Woodfred to Mayari in an almost continuous rain, the trail being so slippery that our mounts were in constant danger of falling, one of the party was thrown, fortunately on a level stretch of road near Mayari, suffering nothing worse than the additional burden of carrying several pounds of the roadway on his clothing. The night was spent at Mayari and before dawn next morning we embarked in a motor-boat, as the guests of Mr. Effingham Dun, and went down the river about sixteen miles, into Nipe Bay. Touching at Felton, we continued eastward through an artificial canal into Lebisa Bay, arriving at a landing place near El Purio about nine o'clock. Our intentions were to get to the pinelands on the low foothills nearby, as their altitude was considerably lower than they are known to be at any other place in this region. As we were unable to secure horses for the entire party, Dr. Schaefer and myself were content to collect on the peninsula. The usual limestone formation and its flora of the coastal region occurred. The country is broken into low hills, the soil yellow and quite fertile, but very sticky in the rain, which lasted practically all day. On the way back we disembarked at Felton, and returned to Woodfred next morning by the ore train.

Loma Menqura, the round-topped peak so prominent in the southern horizon as one approaches Nipe Bay by steamer, is situated about eight miles south of Woodfred, and is reached by the Bandera trail. It is composed of serpentine rock, rising out of the pine-covered plateau, which at this point is at about an elevation of 2,200 feet, the summit of the mountain being about 3,100 feet above sea-level. We made an ascent on its easterly side, which is rather dry, very rocky and quite hard to climb. The growth is mostly scattered scrub with an occasional tree of small size, much of it having been frequently fire-swept; the top is rather

flat and covered with broken stone of all sizes among which were found, to our great surprise, many species already collected along the rocky arroyos 1,200 to 1,500 feet below. The northern and western slopes are much steeper and more moist, and are covered with a denser and richer growth and larger trees. It had been our intention to go down this, but it was found to be impractical to do so without remaining in the bush over night. This we were unprepared to do, and it was almost dark by the time we returned to our camp, one of a series of manaca-thatched shacks used by mining engineers in their exploration work several years ago. We remained here for several days, making excursions across the pinelands to the falls of Rio Naranja, and into several of the areas of deciduous trees, called "cayos." They are like islands of deciduous growth in a sea of pines, the largest ones having local names applied to them by the Cubans, who come here from the Mayari Valley and elsewhere to hunt wild pigs, which are quite plentiful. These forests are made up of much the same species as occur near the streams in the northern part of the plateau, but appear to average larger. The soil is rich and black and many ferns and orchids abound. The manaca-palm, so highly prized for thatching, is very abundant and of large size. Another kind of thicket occurring in the pinelands is made up of smaller trees and shrubs, growing among boulders of a very hard brownish iron ore, probably hematite. The most interesting feature of the thicket is a species of *Juniperus*, upright trees thirty to forty feet high with a trunk diameter of four to eight inches, the branches more spreading than our northern red cedar. These trees are easily killed by fire and many more dead trees were seen than living. It was also observed in shrub form on a flat ledge of the same kind of ore, but was not seen on either the serpentine rock or limonite formations, nor at any considerable distance from Loma Menqura, although it was not observed upon it. The return from this excursion was made by way of the Plancha trail, which passes through dense deciduous woods that yielded a number of species not secured elsewhere.

No attention was given to the Mayari Valley, which is highly

cultivated, being occupied by many small farmers, but the limestone region at the foot of the mountains, in the vicinity of Piedra Gorda was studied; also along the railroad as far as Arroyo Seboruco to the marble-like cliffs and its caverns. Part of the valley was also explored and a trip was made on foot across the limestone ridge between this stream and the Mayari at its falls, where the rock is serpentine and the flora is of the foothill scrub.

After some delay and trouble in packing the collections for shipment to New York by Munson Line steamer from Antilla, and the loss of several days in keeping a lookout for the boat for Baracoa, whose sailing time from Nipe Bay was shrouded in considerable mystery, we finally got aboard the S. S. Nuevitas on the evening of February 11. Next morning found us in the little harbor of Sagua, and on the following evening we disembarked at Baracoa.

Baracoa, said to be the most ancient town of Cuba, is picturesquely situated on a small, rather open bay. Next to the several old forts, the most striking object to arrest the attention of the newcomer are the dead and dying cocoanut trees. Everywhere on the surrounding hills, the crownless trunks, the victims of the cocoanut disease are in evidence, no effort having been made to remove them, even by the most intelligent as well as the most interested parties. The region has been sorely stricken by the almost complete annihilation of this i s most important industry.

As very few strangers come to Baracoa, there are few hotels. Their accommodations are as indifferent as their rates are excessive, and it was found necessary, in order to secure suitable accommodations, to rent a vacant house, with a large yard for spreading dryers. Cots and a few chairs loaned to us by newly made friends, together with our camp-outfit completed the furnishings. When in town we usually had our meals brought in by "cantina." Dr. Schaefer remained with me for several weeks before taking the steamer for Havana.

The surrounding hills are of limestone, very much eroded, and evidences of two ancient sea beaches are plainly visible at several places. It is a very rough country, but much of the land, is quite fertile, especially in the small valleys. El Yunque

a massive limestone peak something over 1,800 feet in altitude, has a very flat top and mostly perpendicular white sides, and forms a most striking object, either as seen out in the ocean on a passing steamer, or in the western horizon from Baracoa, from which it

FIG. 27. Cocoanut palms, dead and dying, victims of the cocoanut disease.

is about six miles distant and not difficult of access. Its top was once a coffee plantation and as it is supposed to have been visited

by Wright, and later by Pollard, Underwood and Earle, I paid no attention to it at this time.

Several excursions were made into the surrounding hills and valleys. The coast on either side of the bay, and also the lower portions of the Rio Miel and Rio Macaguanigua were examined. Rio Guaba was also visited. The serpentine hills occurring many miles inland were examined, on the trail to Florida. Here they are covered by a dense, low scrub very similar to the foothill region of Sierra Nipe. A few small trees of the Cuban pine are scattered through its higher elevations, and farther south on the "cuchillas" they become plentiful.

The region lying west of Baracoa and extending to Nipe Bay is exceedingly rough, very sparsely inhabited, the settlements usually consisting of a store and a few families, situated on the numerous small bays which are formed at the mouth of the short rivers. There are also a number of small cays that would probably repay an investigation. Communication is by small sailboats, of which there are a considerable number. There is also supposed to be a trail paralleling the coast, but this is very obscure and the many rivers to ford make it very uncertain for travel in the wet seasons. Botanically this region is unknown except in so far that Charles Wright was at La Catalina, southward of Sagua de Tanamo in March, 1861, but he probably got no farther eastward. Of late this part of the country has been of great interest to mining concerns on account of large deposits of nickeliferous iron ore known to exist here, and under the supposition that more may be found, various companies have sent exploring parties and engineers to several points, and considerable field work has been done, camps built, "trochas" and some trails opened, but no actual mining operations begun. One company so engaged is the Jurugua Iron Company, of which Mr. Whitaker of Santiago de Cuba is general manager, and from whom I had letters to their agent at Baracoa and their chief engineer in the field. These letters were kindly secured for me by Mr. Jennings S. Cox, Jr. I also had the good fortune to make the acquaintance of Mr. W. W. Fitch, who had a general oversight of the field work of this company. Their camp "San Benito,"

south of Canete Bay, was supposed to be the farthest point inland in the entire region that had been reached by any prospecting operations. They also assured me that I was welcome to visit it and that I required nothing but my collecting outfit to make the trip. Accordingly, I left Baracoa on the morning of February 21 in the little sailboat, chartered by the company to carry supplies.

I stopped at Navas, where Mr. Fitch had his headquarters, and then continued westward to Canete Bay, where we anchored. The captain informed me that it was too late in the evening for the tender, a small rowboat, to take me up the river to the first camp, so the night was spent on the boat. Early next morning the tender called and after loading it with provisions, took me across Yamaniguey Bay and about one mile up the river to a palm-thatched shack used for storing supplies, and from which all provisions for the men working in the mountains were packed on man-back. Several hours were lost in the delay here, during which the man in charge had sent off the mail carrier and several pack-men, and also elaborately prepared breakfast for me consisting of a box of sardines and a freshly opened can of red pepper skins. All this time the pack-men, awaiting their loads, were discussing with much surprise the Americano and his intention of going "arriba" and tried to dissuade me by gestures and exclamations of "camino malo," "muy alto," "mucha distancia," etc. I learned that the trip was all "á pie" and that but one pack-man could be spared to go with me, so I reduced my outfit to a liberal supply of collecting paper, a change of dry clothing, and my sleeping bag, for I had learned by experience on the Sierra Nipe that the nights are very cool in the mountains and that it was impossible to sleep with the ordinary hammock and blanket.

The trail passes through a dense tropical forest on the alluvial banks of the river for a mile or more and then into the hills, through alternating stretches of scrub-covered serpentine rocks and open, hard-packed, red ore lands with scattered, stunted pine trees, a few shrubs, and a tall dracaena-like plant not seen in the red ore lands at Nipe. As higher elevations

(about 1,400 feet) were reached, the trail ran through pine forests with undershrubbery, alternately up and down hill, crossing several streams, with blackfaced serpentine rock beds, flowing to the right of our course. At about four o'clock in the afternoon we came to a small opening where poles, old tin cans and other rubbish indicated that a camp had once existed. One shack had part of its roof intact, and the pack-man announced that we must stay here for shelter during the night. There was a stream nearby flowing to the right of our course so I spent several hours collecting along its rocky banks. Its elevation was about 1,350 feet, but the name of the stream or whence it flowed I was unable to ascertain. This place was called "Camp Toa." The man had supper prepared when I returned to the shack, the meal consisting of a can of sardines and a piece of hardtack; there was no coffee or tea, but he said he had a can of preserved red peppers, which he would open if I cared to have them. I had a difficult time finding a level spot upon the stony and root-covered floor of the shack to spread my sleeping bag, but rested well in spite of its unevenness.

Early next morning we started off without coffee, leaving the bundle of plants so far collected under the roof of the shack, the man cautioning me not to stop and pick up much along the way as we had a very long and hard journey yet to go. About 9:30, after making a descent along a precipice where it was necessary to hold on to the projecting rocks and roots in order to let ourselves down to a small stream at an elevation of about 900 feet, we gradually ascended through a very rough region with many ravines, landslides and sink-holes, the vegetation of which was rank, but not tall, consisting largely of trees, among them a beautiful, unarmed tree-fern. We crossed a small stream flowing to our left with a bed of soft yellow sandstone and deposits of yellow sand forming small pools containing little fishes. Here I collected several ferns and other plants not noticed before. This formation appears to be very unusual in this region, and a mining engineer told me that he did not believe it was sandstone at all. It is also maintained that no fish exist in the streams of these

mountains; this coincides with my observations of all streams flowing over serpentine rocks, which appear always to be devoid of sand or sand-bottomed pools. From here an ascent to an altitude of about 1,700 feet brought us to a flat, wet plateau of yellow soil containing many small pieces of the supposed sandstone. It was covered with a forest of scattered pine trees, appearing different from the Cuban pine. These trees were ten to forty feet tall with trunks three to six inches in diameter, and branches two-leaved, somewhat spreading, and bearing rather small cones. There were also thickets of low shrubbery, prominent among which was a bright scarlet-bracted euphorbiaceous plant, and on the margins of numerous small pools along the sides of the trail a small creeping *Lycopodium* with erect club-shaped spikes. Passing again into the ordinary scrub of the region, we crossed a stream of rather large volume flowing to the left of our course and came to another abandoned camp similar to the one already mentioned. This was known as "Camp La Barga," elevation about 1,600 feet. Here we took breakfast, "sardinas solas" forming the entire meal. I was informed that we must hurry, as we should have made this our starting point early that morning. Accordingly, I made no further attempt to collect on the remainder of the way, except such small plants as I feared might be overlooked on the return trip. We went through a shallow stony pass, and over a high ridge covered with a very peculiar thicket, most of which was scarcely three feet high. Here I found a number of scattered pine trees which were only five to ten feet tall, their leaves bunched at the ends of long black twigs, the cones small and cylindric and the branches covered with a black hair-like lichen. Another striking plant standing above the top of the shrubbery at this weird place, was a small silvery star-leaved palm from four to six feet high, of which, however, no inflorescence was seen. Aside from the region described above, which was one of but three or four points along the entire trail from which a view of the surrounding country could be obtained, the growth was a dense forest-like scrub about ten feet high, its roots creeping over the rocky soilless surface and covered by a thick mat of long green moss,

which also clothed the trunks and stems of the trees and shrubs, greatly magnifying their apparent diameter.

The trail was very narrow. Not a twig, root or stem that was possible to climb over or pass around had been disturbed and as it became tramped to a lower level than the moisture-laden mat of moss at its sides it became a wet and muddy ditch, too crooked, rough and steep for a pack-animal to travel; not even a dog had passed along it; man was the only being capable of doing so. These conditions, with a heavy portfolio, clothing saturated with the moisture from dripping foliage on the sides and splashing mud below, long before a heavy rain which began during the afternoon, an empty stomach and a general ignorance as to one's whereabouts, made this, the 23d of February, my forty-seventh birthday, one of the most trying days I ever experienced. It was nearly dark when I finally reached "Camp San Benito," where I changed to dry clothing and had a supper of bean soup and the usual accompaniments of a camp meal. This, with the satisfaction of having completed a difficult journey through a very interesting region, together with a good night's rest in my sleeping bag hung up as a hammock, put me in good shape for the next day, the forenoon of which was spent in collecting along the "trocha" westward of camp. The afternoon was devoted to a trip down the long stream near camp and many shrubs not collected by me before were secured along its rocky banks. A beautiful blue-flowered *Pinguicula* occurred among the rocks, and epiphytic members of the same family grew upon the bushes overhanging the stream. Back from the river, the moss-mulched thickets already described contained a few trees over fifteen feet tall and on the banks an occasional pine tree rarely over thirty feet was seen. I was unable to get any name for this stream, nor could the engineers at the camp tell me where it emptied. The camp was situated in a rather flat region, at about 3,000 feet altitude. The trail was said to be twenty-seven miles long, but I afterwards ascertained that it was only twelve and one-half miles in a direct line south of the coast. Probably twenty men were engaged in running "trochas" and drilling for samples of ore. All their provisions and sup-

plies were carried in on man-back, it requiring one man three days to bring in about fifty pounds, two days coming in and one going out.

It had been my intention to do considerable collecting on the return trip and spend about three days along the trail, but as the engineer in charge of the camp was absent and the Spanish youth acting in his stead took little interest in my work and made no effort to understand or supply my needs, I was compelled to alter my plans accordingly.

I could get only three small cans of sardines and two tins of salt meat to sustain myself and one pack-man for two days. As the pack-man was already overloaded, I appealed for more assistance, but without success. I suggested that a man be instructed to gather up such packages as we should leave at the two abandoned camps along the trail on his way down, but this was also ignored. My chagrin can better be imagined than described when a few days later I saw five men come to the lower camp entirely burdenless. On the second day I was compelled to share the burdens of the pack-man and carry a large-sized pack strapped to my shoulders, with which it was quite impossible to get off the trail. We arrived at the storage camp on the evening of the second day, both overloaded, very hungry and tired out.

Next morning I learned that it would be several days before I could get a boat returning to Baracoa, so I explored the rich alluvial Yamaniguey River valley and the low serpentine hills which extend down to tidewater near the mouth of the river and also form part of the shore line of the bay. On both of these formations I collected various species at practically sea-level which in the Sierra Nipe were not supposed to get below 1,000 feet altitude. The spiny tree-fern and the Cuban pine were two striking examples indeed, the specimens of the latter collected here being knocked off the tree from a row boat. Frequent rains during all this time added to our discomfort and anxiety. The collections had much exceeded the capacity of the limited number of driers I brought with me, so that the plants were being kept in damp papers much too long for their proper preservation, as I had not

expected to be gone much longer than half of the eleven days consumed on this trip. However, upon my return to Baracoa I found that very few specimens had been spoiled, but some were badly discolored. It required over a week to care for the collections and to recover from the exposures and fatiguing effects of this very interesting journey.

Another trip was made into the region west of Baracoa by going to Navas, where I arrived on the afternoon of March 18, and was the guest of Mr. Fitch. Almost constant rain frustrated most of my plans, but I succeeded in getting well up the Navas River, on which I observed another species of tree-fern in addition to the spiny one also there at very little above sea-level. The principal object of this trip was to get up to "Camp Buena Vista," an extensive mining camp now abandoned, situated apparently only a few miles directly back of Navas and probably the highest point so near the coast. It is at an elevation of about 2,000 feet and can be plainly seen from boats passing along the coast. The trail to this camp was long and circuitous and had been cut out so that pack-animals could use it. In company with a guide I reached the camp and returned to Navas the same day, my pedometer registering about nineteen miles. Crossing the flats of the Navas River near its mouth, one ascends dry, serpentine, scrub-covered hills before reaching a rough hilly region, whose steep sides are quite fertile, and support a forest of good sized trees. Small cocoanut plantations are met with throughout this region and one wonders how the product is gotten out at a profit. A small river that enters the sea east of the Navas was crossed, and some very steep climbing was required to reach the top edge of a series of "cuchillas," along which one passes to the westward. At times the top is scarcely wider than the trail, with immense precipices on each side. This is very wet and covered with many trees of medium size. A pinnate-leaved palm, called by my guide "palma bolo," was very abundant and is apparently local as I have not seen it at any other point in Cuba. The buildings, of which there were a half dozen or more in good condition, were thatched with the leaves of this palm and are in the midst of what appears to me as one of the

richest and most tropical spots I have visited. A week's stay at this point should well repay the little trouble it would take to establish headquarters here. I much regretted that I was not prepared to remain at the time. Upon my return to Baracoa, on the evening of March 24, I was informed that the little fruit steamer upon which I expected to sail for New York was due to depart on March 30. It required every hour of the intervening time to dry the plants secured on this excursion, and to pack my accumulations for shipment.

While at Baracoa I was much aided by the few English-speaking persons I met and am greatly indebted to Dr. Arthur F. Lindley, to Messrs. J. G. Diesend, W. B. Bemis, and Charles Reese for valuable information and many kindnesses. To Mr. W. W. Fitch, of Navas, I am especially indebted for his hospitality and the opportunity he afforded me to enter a region. which without his aid, would have probably remained botanically unknown, for some time to come.

I secured passage on the banana-laden steamer *Fagertum* on March 30 and arrived in New York on April 4.

J. A. Shafer.

NOTES, NEWS AND COMMENT.

Dr. N. L. Britton, director-in-chief, accompanied by Mrs. Britton and Dr. C. Stuart Gager, director of the new Brooklyn Botanic Garden, sailed for Cuba on August 20. The party was joined by Professor F. S. Earle, and left for the province of Pinar del Rio, where they will spend several weeks in botanical exploration.

Professor Frederic S. Lee, of Columbia University, one of the scientific directors of the Garden, will be a guest of the British Association for the Advancement of Science at its Sheffield meeting. Later he will take part in the proceedings of the International Physiological Congress in Vienna.

Professor Francis E. Lloyd spent the month of August at the Desert Botanical Laboratory, Tucson, Ariz., continuing his studies of transpiration and stomatal movement in ocotillo, *Fouquieria splendens*.

Edward W. Berry, of the Johns Hopkins University, has recently been appointed an assistant geologist of the United States Geological Survey and is now engaged in collecting paleobotanical material in the Southern States, particularly from deposits of Cretaceous and Tertiary age, in continuation of his previous work in North Carolina, Virginia, Maryland and New Jersey. A large part of Mr. Berry's earlier collections from the Cretaceous of New Jersey, containing many type specimens, are included in the paleobotanical collections of the Garden.

Dr. Arthur Hollick, curator, will spend a part of the month of September in field work on Staten Island, in connection with a forthcoming Bulletin of the New York State Museum in the geology of Greater New York.

In conservatory range no. 1, house no. 4, one of the chocolate trees, *Theobroma Cacao*, is again flowering freely. The flowers of this plant appear upon the trunk and the lower part of the branches, differing in this respect from most other plants in which the flowers are borne toward the apex of the branches. Some

of the flowers are setting fruit, and it is hoped that these will mature and produce the pods from which the chocolate beans of commerce are procured. These have been produced a number of times by this or other trees in the Garden collection.

About a year ago reference, with an illustration, was made in this JOURNAL to a desirable autumn-flowering shrub, *Clerodendron serotinum*. This is again in flower, and with its creamy corolla and old-rose or claret calyx is a striking shrub, and one much out of the ordinary.

Meteorology for August.—Total precipitation for the month 1.17 inches. Maximum temperatures recorded, on the 7th, 90°; on the 11th, 87.5°; on the 20th, 86.5°; on the 25th, 88°. Minimum temperatures recorded, on the 6th, 58°; on the 10th, 62°; on the 14th, 58°; on the 21st, 53.5°, and on the 27th, 49°. Heaviest shower occurred on the morning of the 10th, when .55 of an inch fell.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

12 specimens of cacti. (By exchange with the United States National Museum.)

1 photograph of *Batodendron arboreum* from South Carolina. (By exchange with Professor W. C. Coker.)

14 specimens of fungi from the United States. (Given by Mr. C. J. Humphrey.)

75 specimens of fleshy fungi from Sunhurst, North Carolina. (By exchange with Dr. H. D. House.)

1 specimen of fungus from Washington. (Given by Professor T. C. Frye.)

3 specimens of fungi from the United States. (Given by Dr. George G. Hedgecock.)

22 specimens of flowering plants from Vermont. (Collected by Dr. N. L. Britton.)

1 specimen of an orchid from Hawaii. (Given by Miss Winifred J. Robinson.)

42 specimens of flowering plants from Yukon Territory. (By exchange with the Geological Survey of Canada.)

102 specimens of flowering plants from Nantucket Island. (Given by Mr. E. P. Bicknell.)

46 specimens of flowering plants from eastern Greenland. (By exchange with the University of Copenhagen.)

7,500 specimens from eastern Cuba. (Collected by Dr. J. A. Shafer.)

PLANTS AND SEEDS.

9 hardy ferns. (Given by Mr. L. S. Hopkins.)

1 plant of *Cooperia Drummondii*, from Texas. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

3 cactus plants from Mexico. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

6 cactus plants from Mexico. (Given by Dr. H. H. Rusby.)

2 palms. (Given by Mr. A. Heckscher.)

1 plant for conservatories. (Given by Mr. W. H. Sparks.)

37 plants derived from seeds from various sources.

19 packets seed. (By exchange with Bot. Gard. Imp. Univ., Sapporo, Japan.)

1 packet seed of *Furcraea andina*, from Peru. (By exchange with Missouri Botanic Garden.)

1 packet seed of *Aristolochia*, from Mexico. (Given by Dr. H. H. Rusby.)

2 packets seed of *Eucalyptus*. (Given by Mr. Jno. N. Culyer.)

1 packet rose seed from Colorado. (Given by Dr. T. D. A. Cockerell.)

1 packet seed of *Colpothrinax Wrightii*, from Herradura, Cuba. (Given by Mr. F. S. Earle.)

4 packets seed. (By exchange with Public Gardens, Jamaica, W. I.)

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Vol. XI OCTOBER, 1910 No. 130

JOURNAL

OF

The New York Botanical Garden

EDITOR

PERCY WILSON

Docent

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JOURNAL

OF

The New York Botanical Garden

VOL. XI October, 1910. No. 130.

THE DARIUS OGDEN MILLS FUND.

The treasurer of the Garden received early in the year from the executors of the estate of the late Mr. Darius Ogden Mills, long president of the Board of Managers, the sum of $50,000 bequeathed by Mr. Mills. At the meeting of the Board of Managers, held April 18, 1910, in acknowledging the receipt of this money, the following resolution was adopted :

Resolved: That in memory of Mr. Mills, and in appreciation of his services to the Garden as President of the Board of Managers, this gift of $50,000 be, and is hereby designated the DARIUS ODGEN MILLS FUND.

At the meeting of the Board on October 19, 1910, on recommendation of the Scientific Directors, the following initial appropriations were made from the income of this fund:

1. For the purchase of plants, $500. This appropriation will be expended for plants desired for the grounds at a number of different places.

2. For exploration and collecting, $500. This will enable the Scientific Directors to continue the work of botanical exploration in the West Indies, it being planned to send a collector again to Cuba.

N. L. BRITTON,
Secretary.

BOTANICAL EXPLORATION IN WESTERN CUBA.

TO THE SCIENTIFIC DIRECTORS.

Gentlemen: Pursuant to previous authorization to continue the botanical exploration of the West Indies, I have recently visited Cuba again, being absent from the Garden for this purpose from August 20 to Spetember 27, this being my fifth trip to that island. I was accompanied by Mrs. Britton and by Dr. C. Stuart Gager, formerly director of our laboratories, now director of the new botanical garden in Brooklyn, which is being established by the Brooklyn Institute of Arts and Sciences, and to their aid much of the success of the expedition is due.

Professor F. S. Earle, formerly one of our curators, now agricultural expert of the Cuban-American Sugar Company, joined us in Havana on our arrival on August 24, and the first field work of the trip was done that afternoon at Cojimar, on the coast

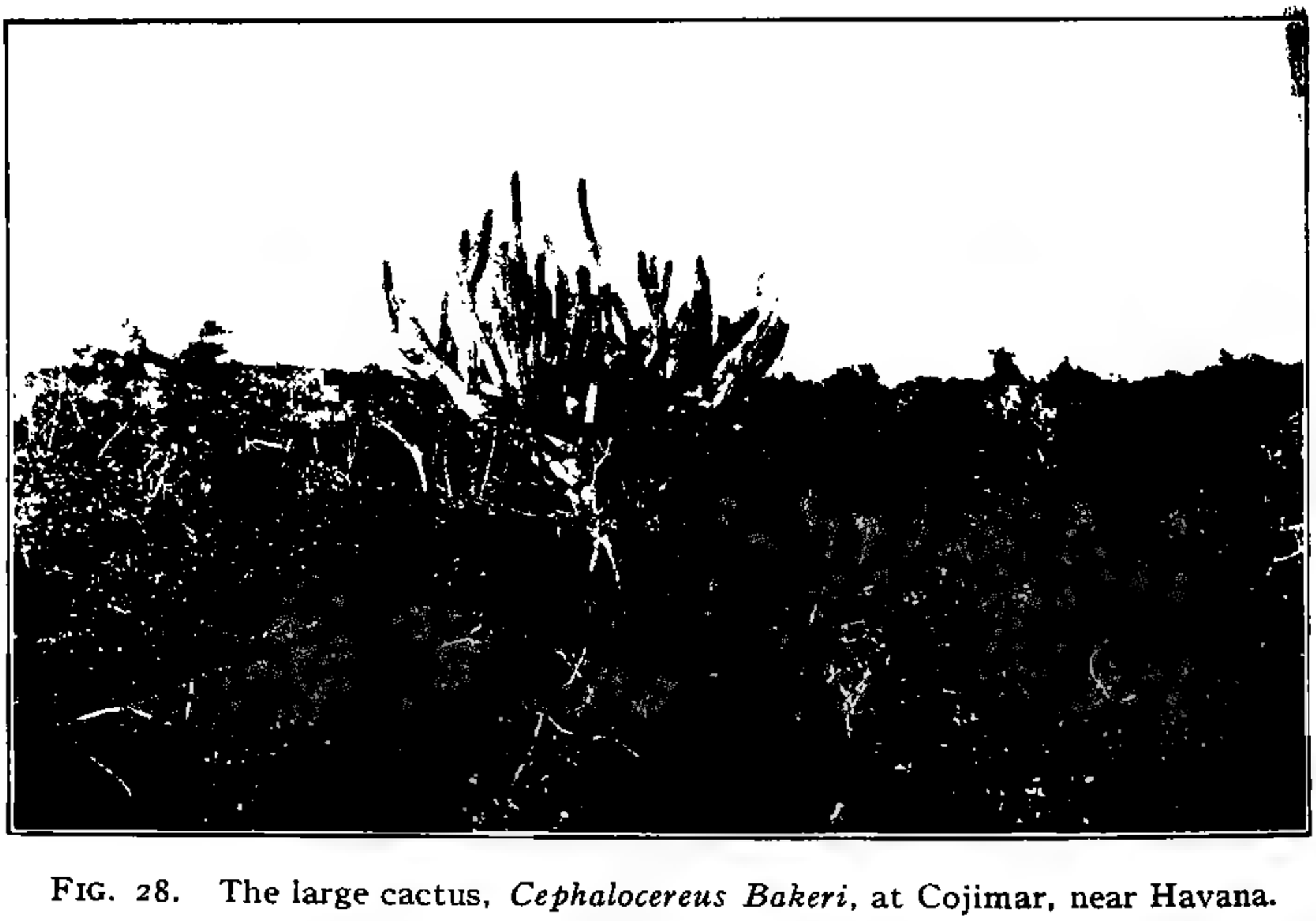

FIG. 28. The large cactus, *Cephalocereus Bakeri*, at Cojimar, near Havana.

just east of Havana; we had studied the coastal thickets there in February, finding many plants of interest, and this second visit revealed others which were not in flower at that time. Some species which I hoped to find here could not be detected; an interesting phase of Cuban botany is the apparent extermina-

tion of a considerable number of species recorded by authors as growing near Havana, but not recently found. It may be that some of these are very local in distribution and that recent students have therefore failed to find them. The botanists attached a few years ago to the Cuban Agricultural Experiment Station did considerable field work near Havana, and our valued correspondent Brother Leon of the Colegio de la Salle at Vedado, has also collected quite extensively here, but a number of trees and shrubs remain lost, and are known to science only from the old specimens preserved in herbariums and museums of the Old World. It is desirable to make still further search for them, and I propose to locate a collector at Havana, when convenient, in order to make another attempt to obtain specimens for our collections, and to describe them, if found, more completely than has been done.

On August 25 after a visit to the Botanical Gardens of Havana where we observed many plants of interest, we proceeded westward by rail to Herradura, near the center of the Province of

FIG. 29. The Barrigona Palm, *Colpothrinax Wrightii*, near Herradura.

Pinar del Rio; a study of the flora of this western part of Cuba was the principal object of our expedition. I had previously visited parts of all the other provinces, but Pinar del Rio was altogether new to me; collections made by previous students had demonstrated the great difference that exists between its flora and that of the central and eastern parts of Cuba; I was therefore prepared for novelty, and we found it in abundant measure.

At Herradura we were the guests of Professor Earle and Mrs. Earle in their characteristic Cuban farmhouse, and to them we are

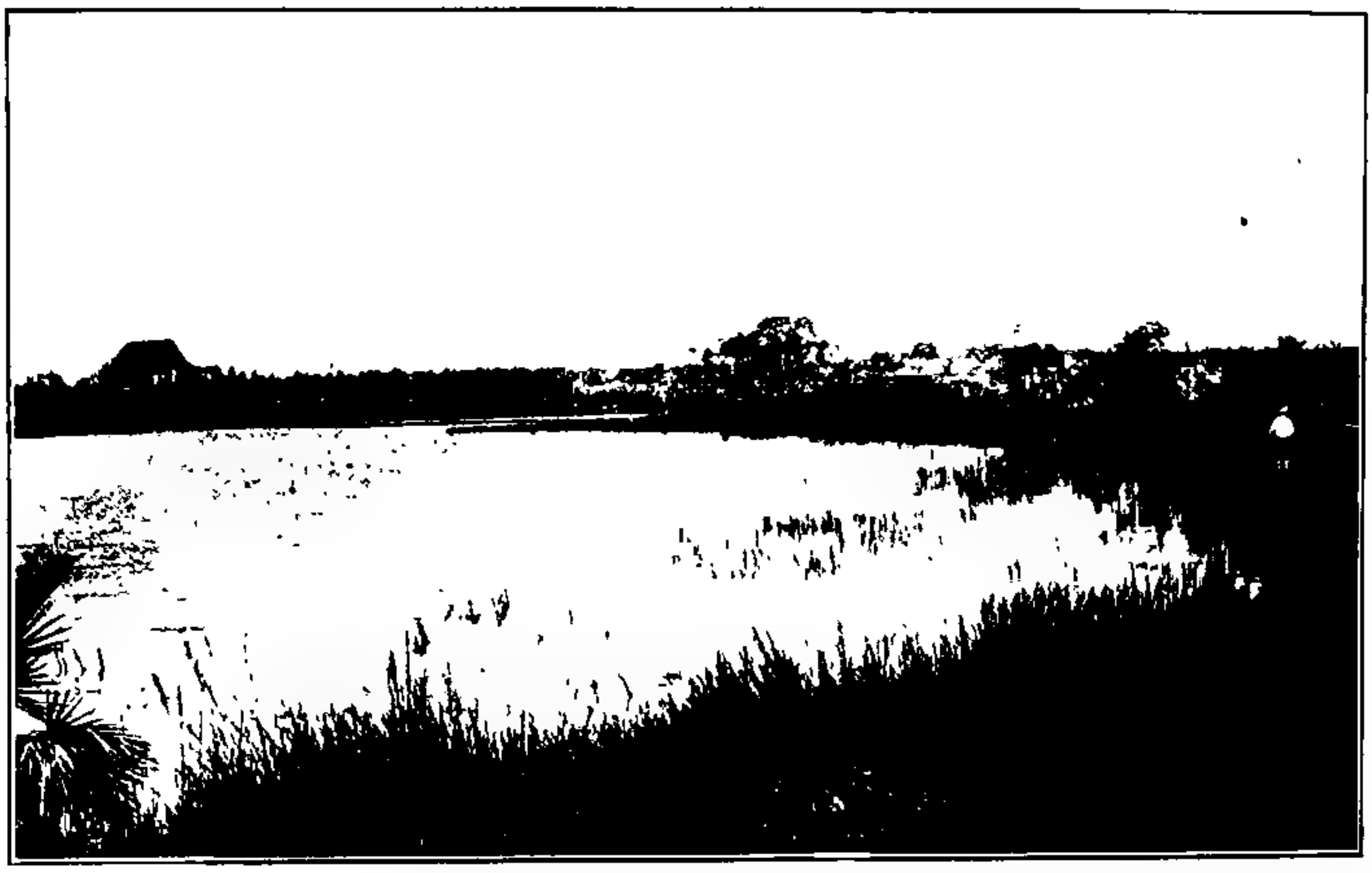

FIG. 30. Laguna Santa Maria, near Pinar del Rio.

indebted for coöperation and hospitality which made our work easy and rapid; we used this delightful spot as a base of operations from August 25 to August 31. Herradura is located in the northern part of the undulating plain which stretches from the bases of the mountain range which parallels the northern coast of Pinar del Rio, south to the Caribbean Sea, the general elevation of the district being from 120 to 160 feet. *Mira las lomas* is the appropriate name given to the house by Mrs. Earle, and the views of the hills to the north are truly beautiful. This broad plain is traversed by numerous streams flowing southward,

their valleys rather shallow, but sometimes with quite steep banks, and in these *arroyos* many different trees and shrubs find congenial homes, among them the pinnate-leaved *Manaca* palm (*Geonoma*), and a beautiful tree-fern, the latter class unusual at such low altitudes; the streams occasionally broaden out into lagoons, in which fine water-lilies and the beautiful yellow-flowered floating heart (*Nymphaeoides*) abound; here also grow many interesting shrubs of the meadow-beauty family, so numerous in species in tropical America, represented in our own flora only by the genus *Rhexia;* low ferns in variety occur and among them a fine climbing one (*Lygodium*).

The higher gravelly areas are characterized by the Caribbean pine, with an associated flora of much diversity, the Cuban oak, not specifically separable from the live oak of the southeastern United States, being the largest hardwood tree of these soils.

The slopes, swales and savannas are marked by two highly interesting palms, one the barrigona, or bottle-palm (*Colpothrinax*), a fan-leaved species reaching fifty feet in height, or more, with a trunk much bulged near the middle; the other also fan-leaved (*Paurotis*), with spiny leaf-stalks, and a low cylindric trunk covered with their persistent bases, and in this association shrubs and herbaceous plants differing from those of the pine-lands abound. The royal palm (*Roystonea regia*), the grandest palm of the West Indies, is locally abundant, as nearly throughout Cuba, on various soils, and with it grow many low plants not observed in the other associations mentioned.

On August 31 we travelled northeast by wagon from Herradura to San Diego de los Baños, situated in the foot-hills of the mountains and famous for its sulphur-water baths, and studied the flora of the craggy limestone hills, the wooded valleys and pine-clad slopes until September 3. The flora of the limestone hills and mountains is abruptly and almost totally different from that of the plain. The most striking tree is the mountain palm (*Gaussia*), a slender species anchored in the rough limerock by many coarse fiber-like roots, the trunk bulged near the middle somewhat like that of *Colpothrinax*, but pinnate-leaved and remarkably slender below and above the bulge. On steep cliffs

we found a remarkable cactus of the genus *Harrisia*, growing pendent and straggling over the rocks and in this respect and others different from all its known relatives; many kinds of ferns were obtained in deep holes of the limestone and in the wooded

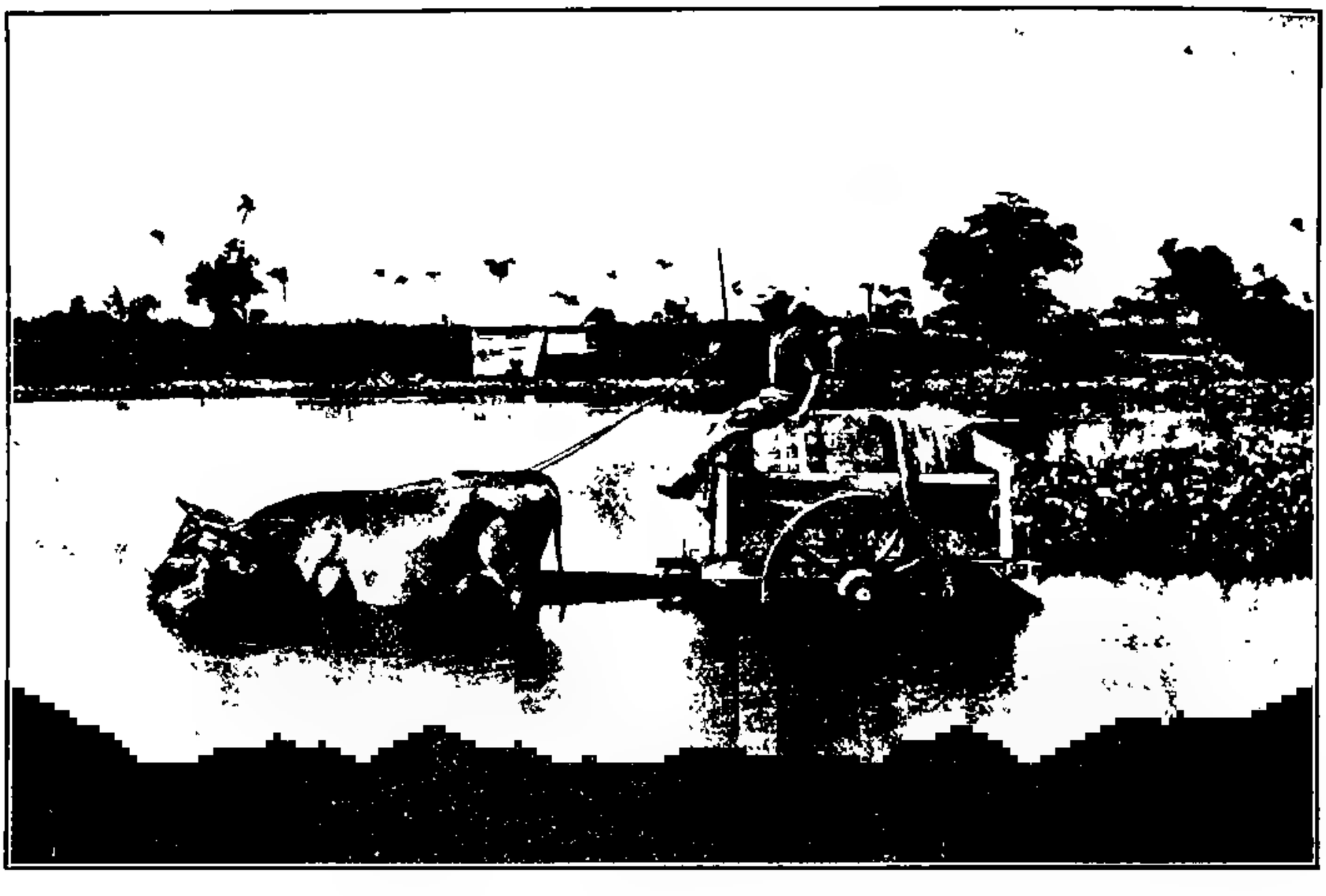

FIG. 31. Lake in the Tobacco Lands, Pinar del Rio. Water Hyacinth, *Piaropus crassipes*, on the margin.

valleys, and several fine aroids and bromeliads were collected. Returning to Herradura, parts of three days were given to the care of the collections already made and to further field work in the savannas.

On the morning of September 5 we proceeded westward by rail to the city of Pinar del Rio; and from there the country north and south was studied botanically until September 12, transportation by carriage being comfortable and convenient over the recently built *calzadas*, fine stone roads constructed during the second occupation of Cuba by the United States army, reaching from the south coast at Coloma to the north coast at Esperanza, eastward all the way to Havana, and westward over high pinelands towards Guane. Splendid views of the southern coastal plain are had from the Guane *calzado*, which winds beautifully among the *lomas*, reaching altitudes of over 800 feet a few

miles from Pinar del Rio. Taking the cross-section of the island made easy of study by the Coloma-Esperanza road and the country adjacent to it, we find at Coloma a mangrove-fringed coast with a pretty little harbor, the littoral vegetation that of all similar regions in the West Indies. This is immediately succeeded by a nearly level belt raised only a few feet above tide-water, characterized by a dense forest of the low *palma blanca* (*Copernicia*) and an associated flora of great variety, both immediately among the palms and along fresh-water streams and marshes. A wand-like golden-rod (*Solidago*) reminded us of home; the tall *Thalia* in the marshes with long loose clusters of purplish flowers was a conspicuous floral feature. Succeeding this *Copernicia* plain come savanna lands marked by the *Paurotis*

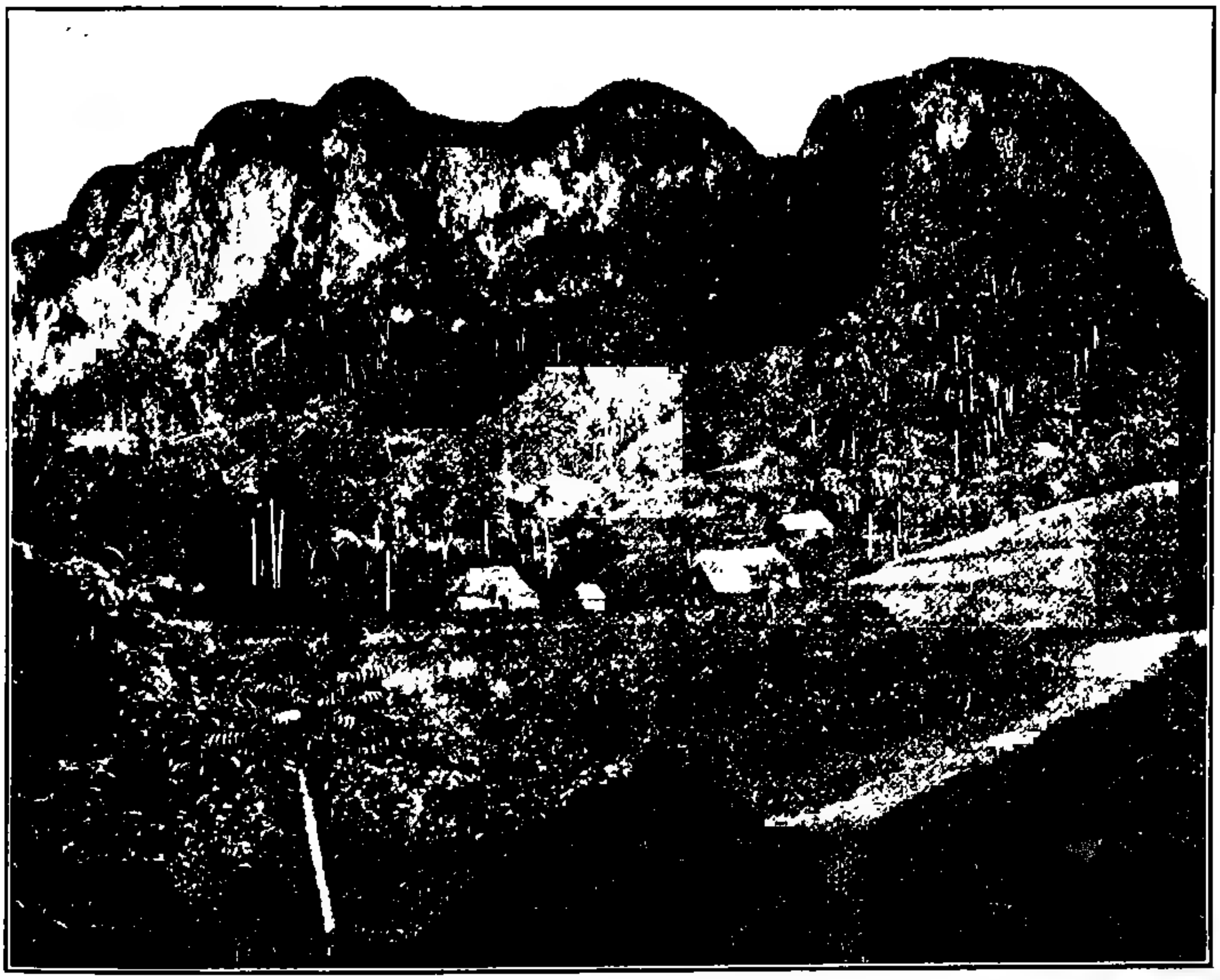

FIG. 32. The Sierra near Baños San Vicente. Royal Palms on the talus.

palm in great abundance, with many fresh-water lagoons and moist sedgy swales remarkably rich in species of low herbaceous plants like those of similar areas of our southeastern states, including sundews (*Drosera*), yellow-flowered bladderworts (*Utric-*

ularia), ground orchids (*Bletia*), and the showy purple-flowered Angelonia of the snapdragon family.

Slightly undulating pinelands come next as we proceed northward, in which grow many characteristic herbaceous plants and

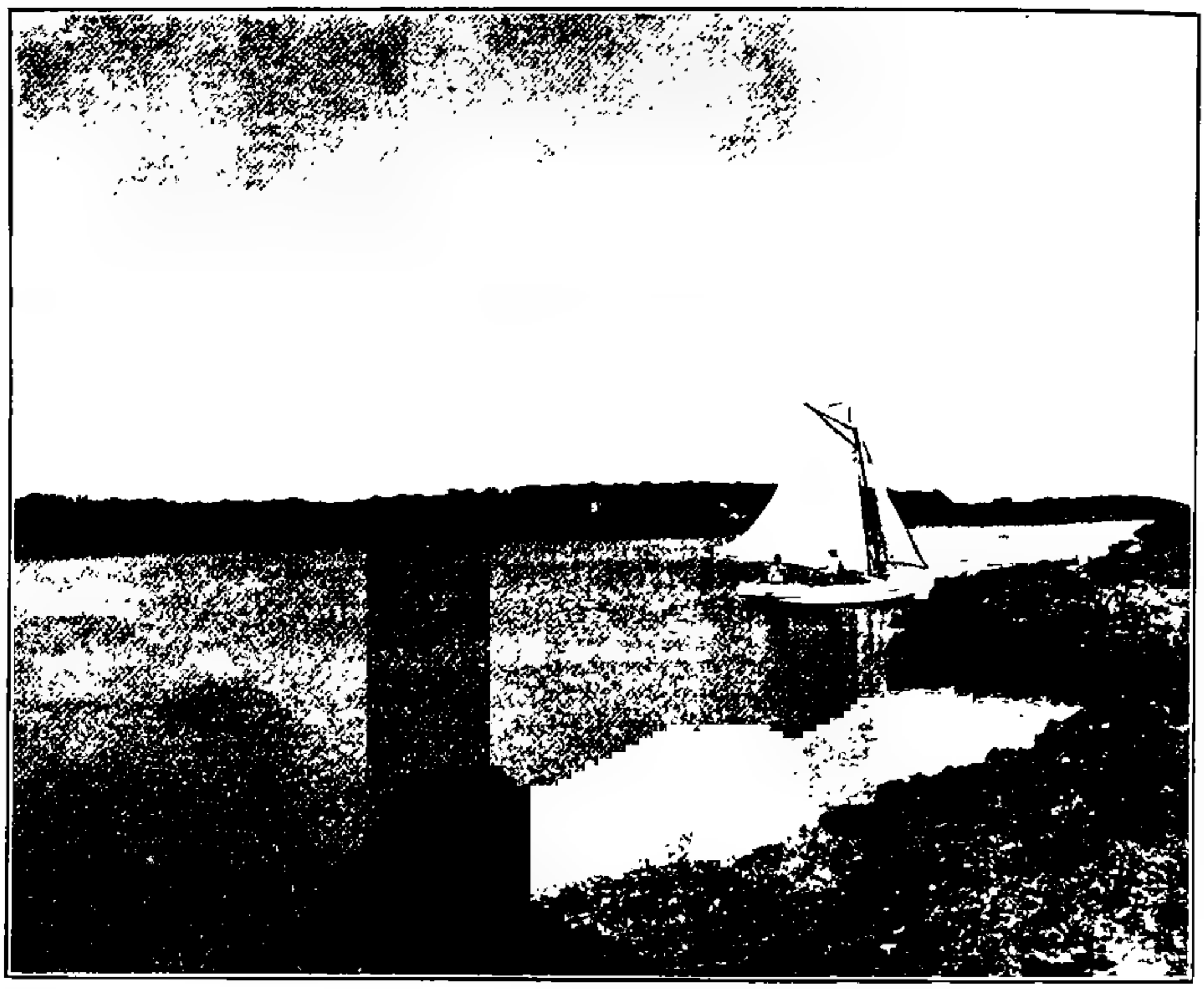

FIG. 33. Bay of Mariel.

shrubs. A few miles west of the *calzada* lie the large fresh-water lakes at Laguna Santa Maria, nearly surrounded by pine barrens, the soil of which is a fine white sand, and this locality proved one of the richest collecting grounds visited during our trip. A tall wand-like white-flowered ground orchid, and two different green-flowered ones were of much botanical interest; several kinds of yellow-eyed grasses (*Xyris*), a white-flowered bladderwort in the water and a large yellow-flowered one on the borders of the lagoons, with a purple-flowered species of the Burmannia family, clubmosses, a *Sabbatia*, with large white flowers and many other species were collected, both the soil and the flora being similar to those of pine-barren areas in southern New Jersey.

To the north of the pinelands and extending northward to the base of the hills lie the rich tobacco lands of the Vuelta Abajo, highly cultivated and their original flora mostly long ago exterminated, except in limited isolated patches. Groups of royal palms and of the *palma caña* (*Sabal*) remain, and with them enough species of other plants to show that their primaeval flora was widely different from that of pinelands or low savannas.

Hilly pinelands and oaklands on shaly soil succeed the tobacco lands; the numerous streams have cut them into deep broad *arroyos;* in the bottoms of these valleys shrubs and trees grow in large variety, many of them the same as those observed along the streams at Herradura, but each little valley visited contained some species different from those found before, and we by no means exhausted their botanical possibilities. A most striking floral feature of the pinelands near the Guane road, on the Sierra de Cabra, at about 800 feet altitude, is the red-flowered shrub *Befaria*, related to our rhododendrons, abundant there, but not seen elsewhere by us.

In order to obtain a convenient stopping place from which to study the flora of the limestone sierras, and that of the country between them and the northern coast, we drove on September 12 to the Baños San Vicente, where there is more sulphur water, and remained there until September 17. Hilly pinelands extend north nearly to Viñales, with an outcropping ledge of limestone on the way. Coming into the fertile valley of Viñales the craggy limestone masses of the sierra almost burst into view, and for the next fifteen kilometers the road affords mountain scenery as picturesque and attractive as one could wish to see; long and short, high and low, but invariably steep hills and mountains are all about, rising abruptly, and clothed luxuriantly with a varied tropical vegetation; to lovers of natural beauty this drive alone is worth all the time required for a trip to Cuba, but being quite off the line of tourist travel, the region is little visited.

In places the cliffs are nearly vertical to a height of 700 feet or more. Ascent may be made here and there on the talus of broken rock and up some of the valleys, but the limestone is so rough and jagged (termed *diente-perro* by the Cubans) that

neither horses nor mules can go on it, and the ascent requires hand over hand climbing, taking advantage of trees and shrubs on the way, and putting one's feet where you know where they are at every step. Among characteristic plants of this formation are the mountain palm (*Gaussia*), and a beautiful thatch-palm (*Thrinax*); a maguey (*Agave*) is very abundant, not in bloom at the time of our visit, but beginning to send up its flower-stalks; a curious green-barked tree, *Ceibon* (*Bombax emarginatum*), the trunk tapering upward, the fibrous inner bark used for packing

FIG. 34. The bushy cactus, *Harrisia eriophora*, Bay of Mariel.

tobacco into bales, is dotted all over the forest; long vines of the genus *Solandra* droop from the cliffs, their large greenish-white flowers very conspicuous; showy white-flowered shrubs of *Portlandia* and red-flowered *Gesnerias* ornament the cliffs and in moist places at the foot many species of fine ferns and mosses are found; a shining green-leaved aroid (*Anthurium*), clings to the cliffs in almost impossible situations; floristically and orographically this is one of the most attractive places in the West Indies.

North of the Sierra there is a repetition of pine and oak-clad hills and wooded *arroyos* extending nearly to the coast at Esperanza. Here we find a mangrove littoral flora, with low thickets, which contain some species of shrubs and small trees not observed on the southern coast, among them *Catesbaea spinosa*, one of the most elegant low trees, bearing long, drooping, whitish flowers, which are succeeded by snow-white fruits the size and shape of small hen eggs; it was laden with fruit and we observed it with much interest and admiration.

Returning to Pinar del Rio on September 17, a study of a low oak chaparral was made south of Viñales, and some species not elsewhere observed were collected. We travelled to Havana on

FIG. 35. The coastal palm, *Thrinax parviflora*, mouth of Bay of Mariel.

the afternoon of September 18. The remainder of our time was devoted to a study of the coastal hills and low cliffs about the bay of Mariel, some twenty miles west of Havana. A sail-boat was used, and a comprehensive view of the flora was obtained. Many of the species are the same as those of the coast nearer Havana, but many are different. We were especially pleased to find the rare skullcap, *Scutellaria havanensis*, abundant on shaded limestone rocks, its blue-purple flowers very pretty and delicate. The bushy cactus, *Harrisia eriophora*, is scattered through the

thickets and two species of the climbing night-blooming cactus, *Selenicereus*, were obtained, one of them bearing a beautiful pink fruit.

The expedition was wholly successful; our collections are enriched by living plants, seeds, museum and herbarium specimens of 1,415 field numbers, the total number of specimens obtained being over 3,500. Dr. Gager was the photographer, and obtained over 120 negatives of plants, landscapes and characteristic Cuban scenes, which are valuable as records and for purposes of illustration.

Scarcely any real discomfort and no illness whatever were experienced and we received the most courteous reception and cordial attention throughout.

Respectfully submitted,

N. L. BRITTON,

Director-in-chief.

THE FRUIT OF THE GREAT RAGWEED AS FOOD FOR GRAY SQUIRRELS.

The ragweeds form a group of plants that have long forced themselves unpleasantly upon the attention of that suffering portion of humanity which is annually subject to hay-fever. It is the pollen of the ragweed, *Ambrosia trifida* L., with that of certain other plants, which is regarded as the cause of this most annoying affliction. Naturally, there are many people who are interested in the extermination of these troublesome plants, and in some sections of the country (in the Adirondacks and on Marthas Vineyard) more or less organized efforts are made to eliminate the ragweeds and golden-rods from the local floras. To those engaged in this work, and to most of those suffering yearly from hay-fever, the assistance of any ally will probably be gladly welcomed.

Such an ally seems to be the common gray squirrel. During the latter part of September, a gray squirrel in Bronx Park was observed running up the trunk of a young tree, with a leafy stem of *Ambrosia trifida* in its mouth. Seating itself in a crotch of

the tree it apparently ate the seed borne in the axils of the leaves and dropped the stem to the ground. An examination of the numerous specimens of this weed in the immediate vicinity showed many plants whose seed-bearing branches had been gnawed off. As the place where the squirrel was actually seen eating the seeds is well guarded by a high wire fence, and as it is, furthermore, one to which visitors rarely resort, there seems to be little, if any, reason to doubt that the many stumps on the plants are remnants of branches gnawed off by the squirrels.

How extensive a habit the eating of the seeds of this species of *Ambrosia* is among the gray squirrels, and, consequently, how great a check upon this particular ragweed's increase it may be, are matters about which it is difficult to assert anything. It should be borne in mind that only one squirrel was actually observed eating the seeds. The plants are, however, so numerous hereabouts that there seems to be no present cause for hay-fever sufferers and their sympathizers to rejoice, or for those interested in the protection of the local flora to be downcast over the speedy extermination of *Ambrosia trifida*.

It may also be pertinent to suggest that possibly the squirrels may have taken to eating the seeds of the ragweed, as well as certain parts of other plants, by reason of the recent destructive effects of the chestnut tree fungus, which has cut off one of their principal former sources of food supply.

EDWIN W. HUMPHREYS.

WINTER DECORATIVE SHRUBS.

What can we do to make our out-of-door surroundings more attractive during the long winter months? From spring until fall we have an abundance of flowering trees, shrubs and herbs to make bright our landscapes, and if we will only choose the right ones, some of the shrubs and trees will delight the eye during the bleakness of winter. While these lack flowers at that time of the year, and while most of them lose their foliage at the approach of cold weather, there are certain others which have a

winter attractiveness often overlooked. We must look for these attractive features in the color of the bark, in the evergreen foliage, or in the bright persistent fruits. Some of the plants desirable for winter effects are given below, with a brief description of each from the stand-point of the horticulturist. There are many others which may be employed, but those enumerated are of easy acquisition at most nurseries. For convenience of reference and selection they are grouped according to their attractive winter features.

Species desirable on account of their colored bark:

Kerria japonica, often called the Japanese rose, grows 4–5 feet tall and with an equal spread. The bark is of a yellow green.

Cornus stolonifera flaviramea, the golden-stemmed osier. Bright yellow-green bark, the stems 4–6 feet tall and with an equal spread. Especially sunshiny during the winter.

Cornus alba, *C. stolonifera*, and *C. sanguinea*, the red-stemmed osiers. All similar in habit and size to the golden-stemmed osier, but with dark red bark.

Euonymus alatus. Bark dark brown, curiously winged on the branches. Grows 4–6 feet tall and wide, sometimes a little larger. A very desirable shrub, not only on account of its winged branches, but also for the beauty of its foliage in autumn, and the brightness of its berries.

Forsythia viridissima. With the new branches green. Grows 4–6 feet or more. In mid-spring it has an added attraction in its profusion of yellow blossoms.

The plants in which the value as winter decorative shrubs consists in the evergreen foliage, are divided by horticulturists into two groups, known as coniferous evergreens, such as the pine, hemlock, spruce and fir, and broad-leaved evergreens, of which the rhododendron, holly and laurel are examples. Of these the coniferous evergreens are greatly in the majority. A few of the more desirable follow:

Pinus Cembra, *P. Peuce* and *P. Strobus*, all white pines. The leaves of these are soft and in bundles of 5. Eventually trees, but valuable in group planting until ten or twelve years old.

Pinus densiflora nana, known as the Japanese table pine, or

"Tanyosho" pine. This generally becomes 3–4 feet high and with a spread perhaps a little greater, forming a broad flat-topped mass of dark green.

Pinus montana Mughus, the knee pine. A dense pine of dwarf habit, rarely exceeding 3–4 feet in height, but with a greater spread. A most desirable plant for group work, standing well exposed situations and drought.

Abies nobilis. A large tree where it grows naturally, but in our dry climate of very slow growth. It forms a dense compact plant with a spread equal to its height and of irregular outline. There is a variety *glauca* of this with bluish foliage.

Abies Nordmanniana. Also a tree, but available for sometime before it becomes too large. It has rich glossy green foliage and a conical outline, its spread nearly equal to its height.

Chamaecyparis pisifera, the Sawara cypress, and frequently known in the trade as *Retinispora*. This finally becomes a conical tree, in ten or twelve years as many feet high. The variety *plumosa* is very graceful and of somewhat lower stature. The variety *squarrosa* is very unlike the others in general effect, having needle-shaped widely spreading leaves of a light grey green, giving the foliage a silvery appearance in summer, this being tinged with bronze as cold weather approaches; there is a dwarf form of this, 3–4 feet tall, known as *Veitchii*. The variety *filifera* has long slender drooping tips to the branches and is of lower growth; there is a golden form of this called *aurea*, which has a dwarf habit, 3–4 feet high with a little greater spread.

Chamaecyparis obtusa, the Hinoki cypress, and frequently known in the trade as *Retinispora*. Of more open habit generally than *C. pisifera*, excepting the dwarf forms. In a dozen years it may attain a height of an equal number of feet. The variety *aurea* has the tips of the branches golden. There are dwarf varieties. One of these is *nana*, of rather irregular outline and commonly 2–3 feet tall, and the form with golden branch-tips, known as *aurea*. Another desirable dwarf variety is *compacta*, of dense more regular outline and growing 3–4 feet high.

Pseudotsuga mucronata, the Douglas spruce. This, although a tree eventually, will not outgrow its usefulness for ten years, if

planted when small. It is a delightful conifer with dark green foliage, with the young growths a yellowish green, offering a striking contrast with the old leaves. It is of conical outline, symmetrical, and one of the best evergreens for this climate, standing drought and exposure well.

Juniperus nana and *J. Sabina*, with the ascending stems 2–4 feet high. A form of the first, known as *aurea*, is effective in the bright yellow tips of its branches.

Juniperus prostrata and *J. chinensis procumbens* are of trailing or prostrate habit, and useful along the margins of a group.

Juniperus virginiana glauca, the blue red cedar, is of a beautiful bluish green and highly decorative. It is much less subject to the attack of red spider than is *J. virginiana*, the common form of the red cedar.

Picea pungens glauca, the glaucous Colorado blue spruce. Although eventually attaining considerable height, it is desirable for many years as a group element. It is of conical regular outline, taller than broad. The young growths are of a beautiful steel blue, making it a most striking object.

Taxus cuspidata nana, the dwarf Japanese yew. A most desirable plant, much hardier than the English yew. Grows 2–4 feet high and of equal or greater width. Very attractive in its rich deep green foliage and red fruits.

Thuya occidentalis globosa and *T. occidentalis* Little Gem are dwarf forms of the American arbor vitae, the former of globose habit, 2–3 feet high, the latter very dwarf and broader than high.

Tsuga canadensis pendula, a dwarf form of our common hemlock, with a broad somewhat depressed top and long spreading branches drooping at the end. It rarely attains a height of more than 2 feet, with a spread sometimes of 4 feet. An excellent plant and of unusual appearance.

The following are some of the best broad-leaved evergreens:

Ilex crenata, the Japanese holly. An excellent shrub of dark green thick foliage, with a neat appearance and irregular outline. Commonly grows from 3–6 feet tall and broad.

Ilex opaca, the American holly. It is this plant which furnishes the greater part of our Christmas holly. Of slow growth in this

vicinity. Its associations make it very appropriate in winter outdoor decoration.

Azalea amoena. Usually 2–4 feet tall and of equal spread. Its foliage bronzes beautifully in the winter. It of course adds the charm of flowers during the spring.

Rhododendron. Any of these may be used, their dark green foliage being very effective. Early summer also brings an added attraction in the flowers.

Odostemon nutkanus, and often known as *Mahonia Aquifolium* or *Berberis Aquifolium*, the Oregon grape. Of erect or ascending habit, 2–3 feet tall and about as broad. The spiny leaves bronze beautifully during the winter.

Cotoneaster buxifolia, *C. rotundifolia* and *C. microphylla*, known as wand-boxes. These are much alike in general appearance, of low stature, 1–2 feet tall, but with widely spreading branches, the width greater than the height. They are decorative in the numerous small green leaves. Do not do well in exposed situations.

Kalmia latifolia, the mountain laurel or calico-bush. 2–5 feet tall, and of about equal width. Its delightful flowers of early summer make it especially attractive in a surrounding of evergreens.

Leucothoë Catesbaei. The foliage takes on a charming bronze color during winter. Grows to 2–4 feet tall, sometimes taller, and of about equal spread. It is also attractive in flower.

It is among the shrubs with persistent fruit that we get some of our most attractive winter features. They are in the main deciduous, so the brightness of the fruit is well displayed. Some of these are:

Ligustrum Ibota, *L. ovalifolium* (the California privet) and *L. Regelianum.* These privets have black fruit and are similar in so far as winter decoration is concerned. Of these the two first are of rather tall growth, 10–15 feet. *Ligustrum Regelianum* is of much dwarfer habit, 3–5 feet, and with widely spreading horizontal branches.

Symphoricarpos occidentalis, the western snowberry or wolfberry. 3–5 feet tall and of equal spread. Its branches are droop-

ing at the end and bear numerous ivory-white fruits about ¼ inch in diameter. Very striking.

Ilex verticillata, known as the winterberry, and its Japanese relative, *Ilex serrata*. Both of these are desirable on account of the bright red fruit, borne in little bunches along the branches. Commonly 4–6 feet tall. The fruit of the Japanese plant is smaller, but is generally borne in greater profusion than in the American species.

Symphoricarpos vulgaris, the coral berry. 3–5 feet tall and of equal spread. Bears quantities of dark red fruit in bunches along the drooping branches.

Euonymus alatus, the winged euonymus. With bright red fruit. Already referred to on account of its bark and curious branches.

Berberis Thunbergii, the Japanese barberry. Commonly 3–4 feet tall, or sometimes taller, and of about equal spread. A most desirable winter shrub. Its fruits occur in great abundance and remain through the winter in a plump bright condition. They are about ½ inch long and of a rich red. This is one of the most desirable all-round shrubs, for it has perennial attractions. During the early part of the season it bears a profusion of flowers, followed during the summer by a dense foliage which will stand well under a drought, and which in the fall changes to a bright red; then the bright red fruit takes up the sequence of attractiveness and carries it through the winter to the time of flowers and leaves.

For those who may desire to try winter effects, and to whom perhaps the above may appear bewildering, I make the following suggestions as examples of what may be done in group combinations. If the space at one's command is limited, it may be necessary to use but a single plant of each kind; if the available space is more ample, they may be planted in clusters of two, three or more. The habit, character, and color of the various elements should be borne in mind in plant-grouping.

For a pure green effect, with no attempt at color, the following elements make an effective combination, an example of which may be seen at the foot of the Museum approach on the left

hand side as you approach the building: *Chamaecyparis pisifera squarrosa*, and its dwarf form *Veitchii; Chamaecyparis pisifera plumosa; Chamaecyparis pisifera filifera; Pinus montana Mughus; Psuedotsuga mucronata; Ilex crenata.*

As a feature in formal surroundings, *Ilex crenata* is very effective, its neat appearance and clean green color especially adapting it to this purpose. The use of it in this way may be seen illustrated around the fountain enclosure at the foot of the approach to the Museum. Combinations of this with coniferous evergreens may also be seen there.

A group including both evergreens and deciduous plants with bright berries can be obtained by employing the following: *Pinus Cembra* or *P. Peuce; Chamaecyparis pisifera filifera aurea; Odostemon nutkanus; Azalea amoena; Ilex crenata; Symphoricarpos occidentalis; Berberis Thunbergii; Juniperus nana; Juniperus chinensis procumbens* or *Juniperus prostrata.* If the Japanese barberry can be so placed as to contrast with the pines, the brightness of its berries will be emphasized during the winter.

For mass effect, though not so satisfactory as single specimens, the osiers, members of the genus *Cornus*, are available. Planted in groups of 10 plants or more they are very striking.

Eliminating the conifers entirely and employing only broad-leaved evergreens and deciduous shrubs, a combination may be formed with the following which will give satisfaction in the fall with brilliant foliage, in the winter with bright-colored berries, and in the summer with attractive flowers: *Azalea amoena*, of which there are several forms with bright flowers which appear about May; *Rhododendron maximum*, which flowers late in June or early in July, or *Rhododendron catawbiense*, which puts forth its flowers in June; *Odostemon nutkanus*, with bunches of yellow flowers in May; *Kalmia latifolia*, with its charming flowers in late May and June; *Leucothoë Catesbaei*, with flowers in May; *Berberis Thunbergii*, its perennial attractiveness already described; *Euonymous alatus*, with its bright fall foliage; *Ilex verticillata* or *Ilex serrata; Ilex opaca; Symphoricarpos occidentalis.*

The above groups may be used with great effect as settings for herbaceous gardens, forming delightful backgrounds for such purposes.

These are merely suggestions as to what may be accomplished in winter outdoor decoration, and with the elements enumerated above combinations may be made to suit the individual fancy of all. A study of the various shrubs available for this purpose will suggest groupings to those interested.

Now a word as to planting, an important factor in the final result, and one too often neglected. Do not plant too close. It is better that the group appear a little too open at first than to ruin the individuality of the various shrubs. Shrubs, as a general rule, should be planted very little closer than the diameter of their ultimate growth. For instance, if a shrub has a general ultimate diameter of 4–5 feet, do not plant closer together than 3–4 feet, unless you want a dense meaningless mass of green with all individuality of the elements lost, and with no undulations to the surface of the group. If your plants are very small to begin with, it is sometimes permissible to plant closer than the ultimate size of the plants would warrant, but only with the distinct understanding with yourself that when the plants begin to crowd you will rearrange your group, taking out enough of the specimens to leave room for the development of the remainder.

GEORGE V. NASH.

THE LONG SUMMER DROUGHT.

The month of June showed a rainfall of 4.84 inches. Of this amount 4.80 inches fell up to and including the 18th of the month. From this time the weather was characterized by unusually low precipitation, only .04 of an inch being recorded for the last twelve days of the month.

During the month of July only three showers were recorded, .15 of an inch on the 7th, .36 of an inch on the 16th, and .13 of an inch on the 30th. A trace of rain was recorded on each of the following dates: 3d, 10th, 12th, 19th, and 27th. The entire rainfall recorded for the month of July was .64 of an inch.

The month of August was characterized by frequent, but very light showers, the heaviest shower recorded for the month amounting to .55 of an inch on the 10th day of the month. In

addition to this .15 of an inch was recorded on the 2d, .05 of an inch on the 9th, .10 of an inch on the 15th, .16 of an inch on the 19th, .11 of an inch on the 26th, and .05 of an inch on the 29th. The total rainfall recorded for the month was 1.17 inches and the showers were quite evenly distributed through the month.

One heavy shower was recorded on the 1st day of September amounting to .90 of an inch, but for the rest of the month less than one half inch was recorded and this in very light showers distributed as follows: .03 of an inch on the 2d, .03 of an inch on the 3d, .02 of an inch on the 5th, .04 of an inch on the 6th, .13 of an inch on the 9th, and .20 of an inch on the 26th. The total rainfall recorded for September was 1.35 inches of which 1.15 fell up to and including the 9th, leaving only .20 of an inch for the last twenty-one days of the month.

One shower was recorded during the first half of October amounting to .15 of an inch on the 7th of the month. The weather continued to be dry until the 19th when a heavy rainfall was recorded beginning a little before midnight on the 19th and extending over the 20th. On the morning of the 20th 1.75 inches were recorded and the long drought broken.

The summer drought extended from the 19th of June to the 19th of October. During this period of four months 3.35 inches of rainfall was recorded. The average precipitation recorded at the Garden for the months of July, August and September for 1905 to 1909 inclusive was 12.60 inches. The rainfall recorded during the same months for 1910 was 3.16 inches.

F. J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. W. A. Murrill, assistant director, sailed for Europe October 1. He will visit many of the larger museums and herbaria to examine type specimens of fungi.

Mr. Fred J. Seaver, director of the laboratories, recently returned from a collecting trip in Colorado. About nine hundred collections of fungi were made in the Rocky Mountains near Denver, at altitudes ranging from 6,000 to 14,000 feet.

Professor Guy West Wilson, of Upper Iowa University, Fayette, Iowa, has accepted the position of assistant in vegetable pathology in the North Carolina Agricultural Experiment Station. Professor Wilson was formerly a research student at the Garden.

Mr. R. C. Benedict has been granted a research scholarship in the Garden for the month of October. He will continue his studies of the fern tribe Vittarieae.

Meteorology for September.—Total precipitation for the month 1.35 in. Maximum temperatures were recorded of 84° on the 4th, 95° on the 6th, 85.5° on the 18th, 86° on the 21st, and 88° on the 26th. Also minimum temperatures were recorded of 50° on the 10th, 47.5° on the 15th, 43.5° on the 23d, and 44° on the 30th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

590 specimens from New Jersey, for the local flora. (Collected by Mr. Norman Taylor.)

3 specimens of West Indian plants. (By exchange with Professor Ignatius Urban.)

265 specimens of lichens from Nevada. (Distributed by Dr. A. C. Herre.)

15 specimens of mosses from Utah. (By exchange with the United States National Museum.)

7 specimens of mosses from Japan and America. (By exchange with Mr. Jules Cardot.)

7 specimens of mosses from Connecticut. (By exchange with Mr. George E. Nichols.)

2 specimens of lichens from Oregon and California. (By exchange with the United States National Museum.)

26 specimens for the Economic Museum. (Given by Dr. H. H. Rusby.)

93 specimens of flowering plants from Colorado. (By exchange with Mr. E. L. Johnston.)

PLANTS AND SEEDS.

123 plants from Cuba. (Collected by Dr. N. L. Britton.)

1 plant of *Opuntia*, from Texas. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

500 hardy bulbs. (Purchased.)

9 plants derived from seed from various sources.

2 plants of *Cycas revoluta*. (Given by Mrs. Samuel Verplanck.)

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EDITOR

PERCY WILSON

Docent

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COLLECTING FUNGI IN COLORADO.

During the past summer, I spent a part of the month of August and September in Colorado, the object of the trip being to study and collect fungi in the Rocky Mountains in the vicinity of Denver. Leaving New York on the fifteenth of August, after a brief stop with friends in Iowa, we arrived in Denver on Saturday, August 20. The first few days were spent with Professor Elsworth Bethel, of the East Denver High School, who is one of the pioneer mycologists of Colorado, looking over his collections of fungi and selecting the more interesting for study, and in planning the course of our collecting campaigns. Much of the time I was accompanied by Mr. Bethel who, being familiar with every part of the state, aided me in selecting the best collecting grounds and very kindly contributed all of the material which he secured to the Garden collections, and in addition to these, numerous other specimens previously collected.

On the twenty-fourth of August we went by way of the Moffat Road, which is well known for its beautiful mountain scenery, to Tolland at an elevation of nearly 9,000 feet. Here we stopped several days and spent the time exploring the gulches and mountainsides in the vicinity, our trips extending up the canyon a distance of about eight miles, the highest point reached being about 10,000 feet. Above this the trees dwindled into

mere shrubs and vegetation became so scant that it was not thought worth while to extend our trip to higher altitudes. Mr. Bethel continually lamented the fact that conditions were so dry that our collections were not a fair sample of what Colorado had to offer in the way of fleshy fungi, but in spite of the dry weather, I had no reason to feel disappointed in the results of this trip, for in the few days spent here several hundred

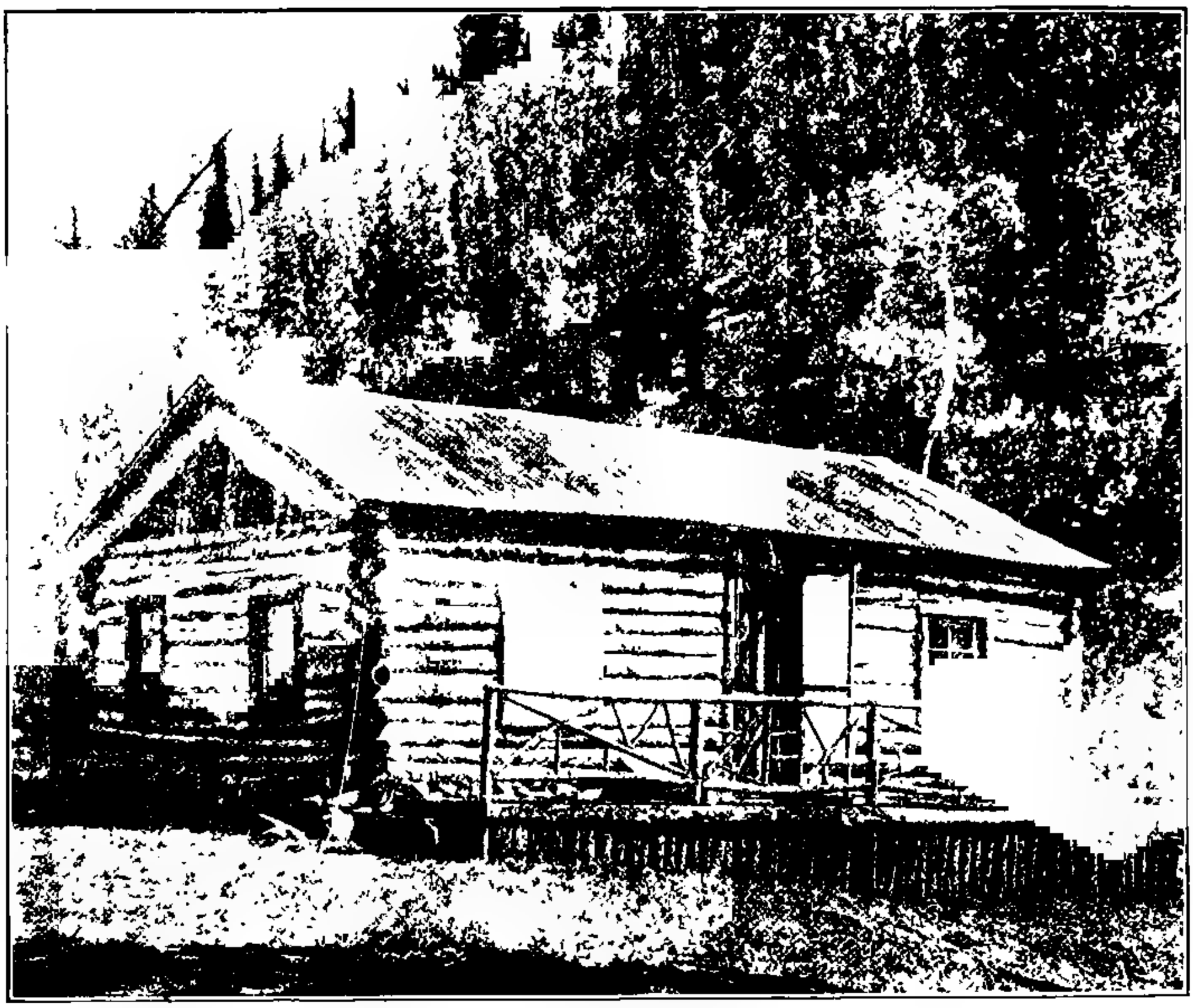

FIG. 36. Cabin, three miles from Grant, in which we lived during our collecting trip in the Geneva Creek Canyon.

specimens of fungi were collected. Professor Ramaley, of the State University of Colorado, who has his summer home at Tolland, very kindly gave us access to microscopes and accessories in his summer laboratory which is also located here. This furnished us the opportunity of making a microscopic study of some of the more interesting collections. Professor Ramaley also accompanied us on one of our longest trips.

After returning to Denver, one day was spent in the foothills

at Golden, at an elevation of 6,000 feet. From Golden we made a trip through one of the neighboring canyons and secured, among other specimens, a number of interesting leaf-parasites.

The principal collecting trip of our entire stay in Colorado was in the Geneva Creek Canyon, a branch of the Platt River Canyon. This is reached by taking the narrow-gauge line of the

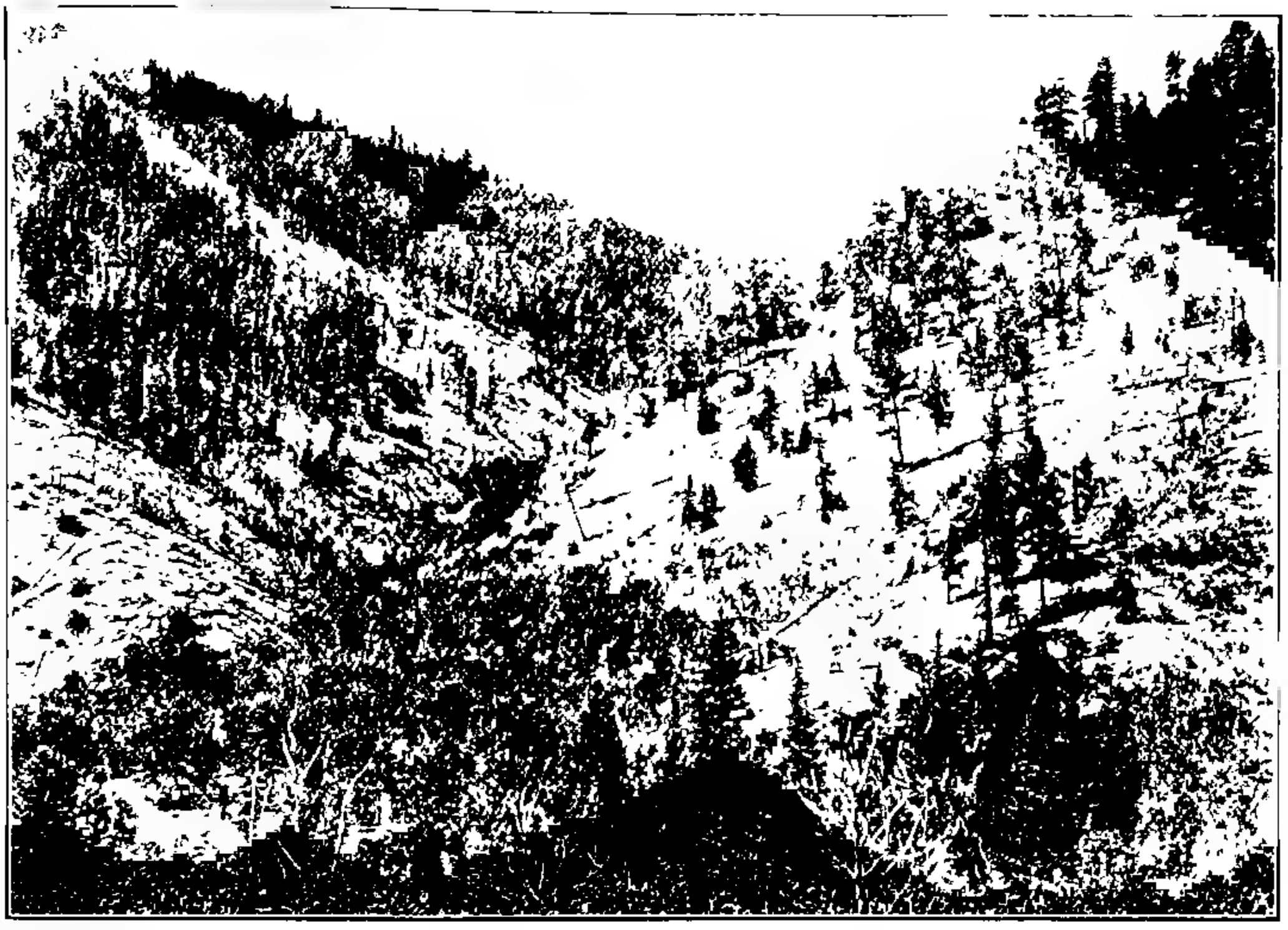

FIG. 37. French Gulch one-half mile above the cabin. This is one of the gulches in which a number of interesting fungi were collected. The trees in the foreground are aspen (*Populus tremuloides*).

Colorado and Southern Railway, which ascends the canyon by keeping close to the river, a swift-flowing, clear stream which as it falls over the rocks adds much to the beauty of the natural scenery of the canyon. Leaving Denver in the morning, we arrived at Grant about noon, a distance of nearly one hundred miles from Denver. From this point we ascended the Geneva Creek Canyon by team to a distance of three miles. Here between two mountain streams is a small park in which a number of log cabins had been built to serve as temporary homes for summer resorters, and in one of these cabins we made our home for ten days. Our cabin was surrounded by numerous gulches

and mountain streams and the most of our collecting was confined to these, since the mountainsides were too dry to afford much outside of a few of the larger woody fungi. The small creeks which flowed through these gulches were bordered with mossy bogs which furnished many species of the smaller fleshy fungi.

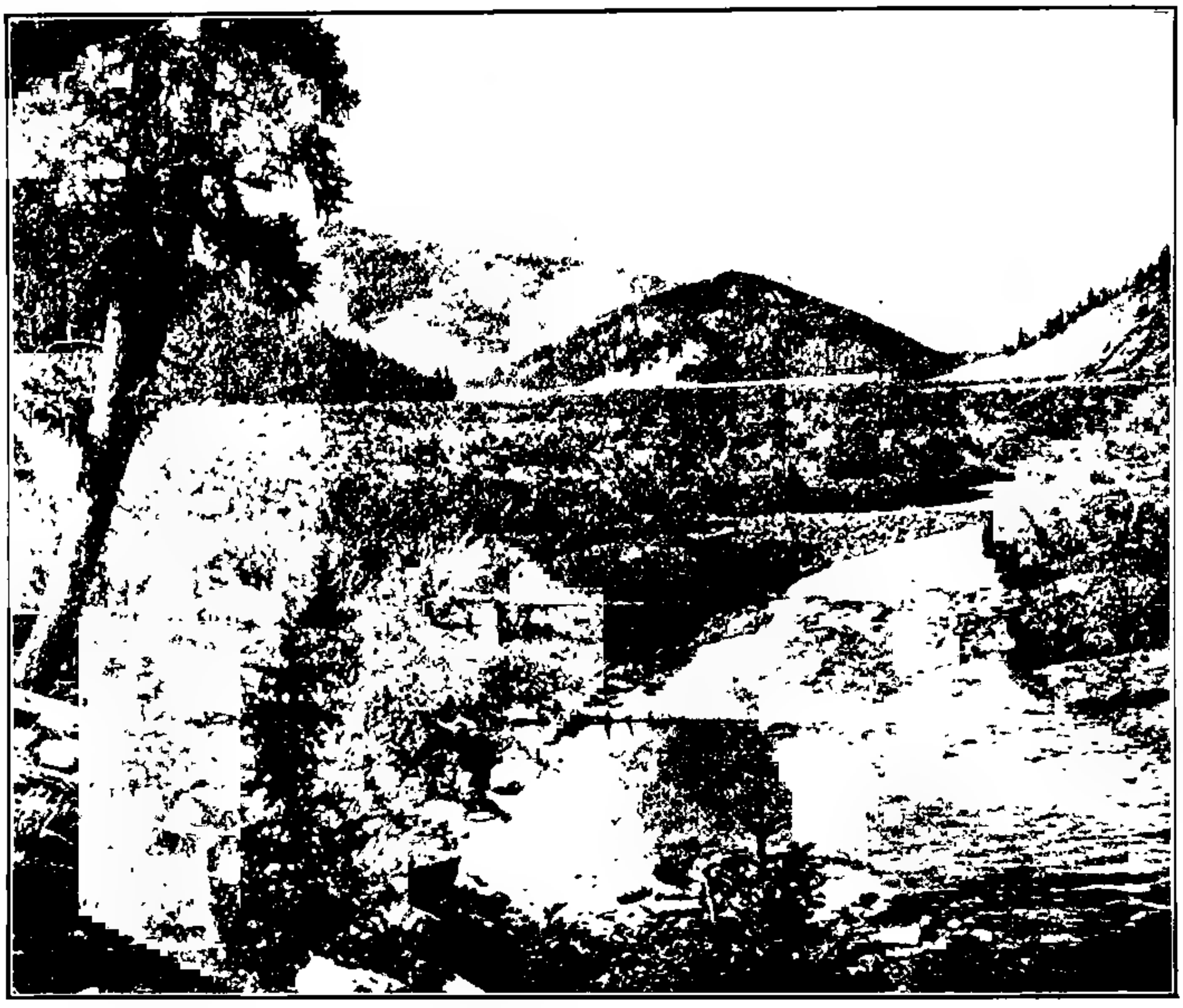

FIG. 38. Geneva Park at an elevation of about 9,000 feet. The mountains in the background have an elevation of between 13,000 and 14,000 feet.

We extended our collecting trips up the canyon and on one occasion reached the crest of the mountain-range at a distance of from twelve to fifteen miles from our cabin and here attained an elevation of between 13,000 and 14,000 feet. Above timber-line the conditions were not favorable for collecting fungi as would naturally be supposed; but I was surprised to find a few fleshy cup-fungi in mossy places even at some distance above snow line. At the crest of the mountain-range vegetation of all kinds was very scant.

One of the most interesting spots visited in the vicinity of our cabin was Geneva Park. The term park as here used applies to any level valley between mountain-ranges. Geneva Park, which was located about three miles above our cabin, is at an elevation of between 9,000 and 10,000 feet and covers an area five to seven miles long and one to two miles wide. The approach

FIG. 39. View across Geneva Park showing swampy character of the soil. Cattle are grazing in the background.

leading to the park is very steep and rocky and probably represents the terminal moraine of a local glacier. The park would then result from the filling in of this natural reservoir with the wash from the mountainsides above. The entire region is surrounded by mountains except the comparatively narrow pass which furnishes an outlet for the creek which flows through it. The land itself is nearly level and the soil is swampy and furnishes a good substratum for fungi.

The country is not favorable for agricultural purposes on ac-

count of the short growing season resulting from the high altitude but the land is extensively used for grazing purposes. In former days it was doubtless a favorite hunting ground for the Indians, judging from the number of broken arrow-heads found in the vicinity. It is still frequented by deer, mountain-sheep and other forms of wild game. A comparatively short dam is all that is necessary to convert this beautiful park into a great natural reservoir and this is now being considered. The water which

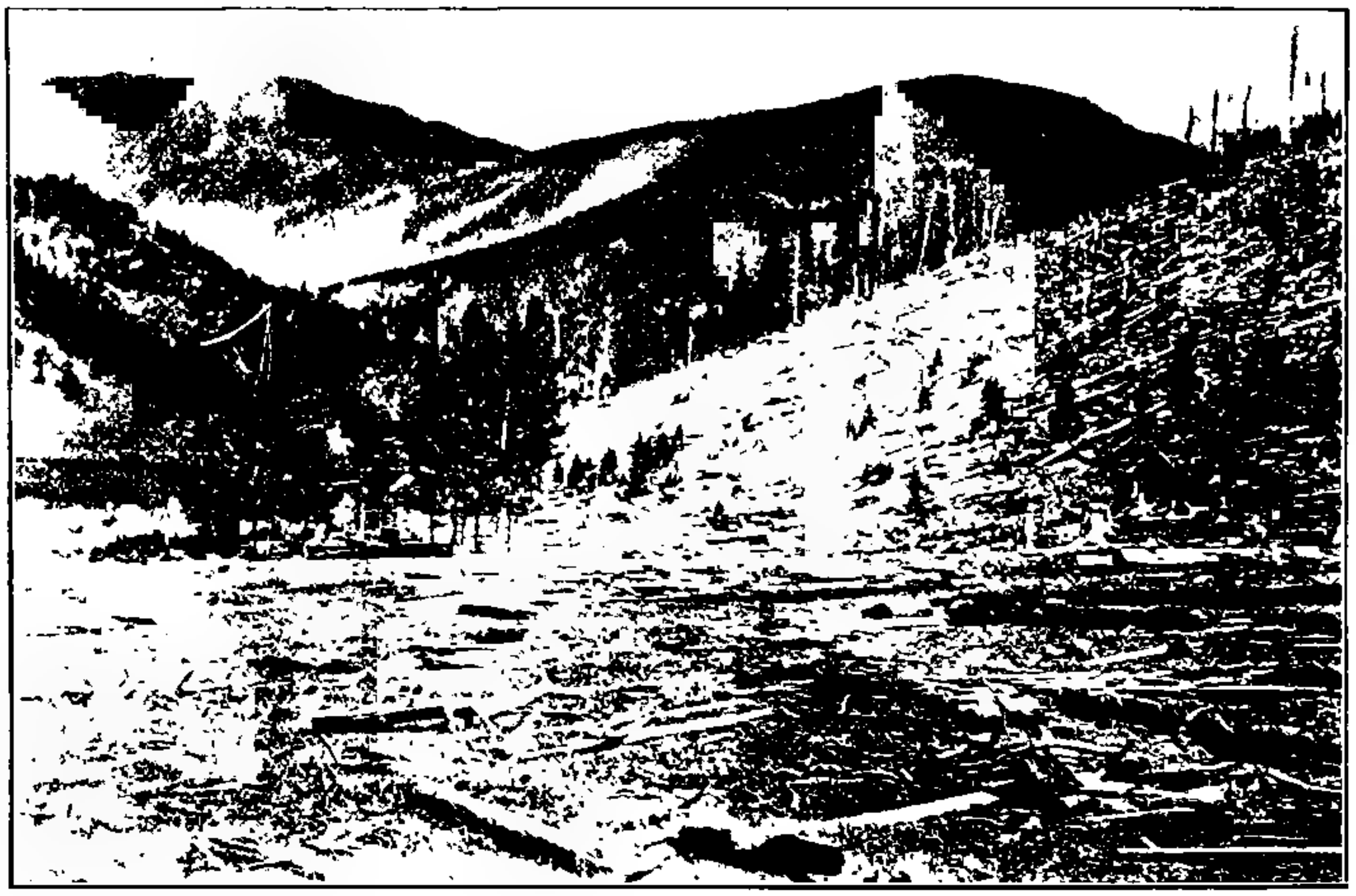

FIG. 40. A mountainside near Geneva Park, from which the trees have been stripped and used for lumber.

could be stored in such a reservoir would serve to irrigate an immense area on the plains below where agricultural work can be carried on only by means of irrigation.

The standing timber, which consists mainly of coniferous trees (spruces, firs and pines), is not as large as would be expected in the canyons visited by us, but this is probably due to the fact that the larger and better trees have been cut down and used for lumber. Numerous sawmills have been operated in Geneva Creek Canyon and in places the ruins of the old mills and the mountainsides covered with rotting logs and charred stumps are all that remain to tell the story of wasted resources. In

places the stripped areas are covered with a second growth of small trees but in other places they remain bare and unprotected.

Among the deciduous trees and shrubs the aspen, mountain-alder, mountain-maple and willows are the most common. In places the aspen occurs in great numbers and attains considerable size and extends as high as timber-line. It, however, decreases in size as we ascend the canyon, and when we reach the timber-line it is no longer a tree but a low shrub and the leaves are so

FIG. 41. Ruins of one of the many sawmills which have been operated in the canyon.

much reduced in size that we would scarcely recognize it as the same plant occurring at lower altitudes. The mountainsides were often covered with patches of aspen trees. Although our visit to the canyon was early in September, the temperature often dropped to the freezing point toward morning and the leaves of the aspen had already assumed the golden and scarlet colors characteristic of the autumn, and these bright colors in

contrast with the dark green of the coniferous trees did much to brighten and beautify the mountain scenery. Although the nights were cool, the air was clear and the temperature rose quickly in the morning so that in the middle of the day it was often uncomfortably warm, and on the whole the weather was ideal for collecting.

FIG. 42. A mountain cabin. Home of Mr. E. Sullivan, a homesteader and mine operator. The cabin is surrounded by aspen trees.

As would naturally follow from the small number of different kinds of deciduous trees and shrubs found in these mountain canyons, the number of wood-inhabiting fungi are relatively few. Several of the larger woody fungi which occur on coniferous trees were very common but here again the number of such species is restricted by the comparatively small number of different kinds of host plants. The smaller fleshy fungi which occur in moist soil, leaf-mould and mossy banks were quite abundant. The large flesh fungi were, judging from reports, not so abundant as usual on account of the dry season.

Probably the most interesting collections were among the cup-fungi. The number of such fungi which occur on damp soil, mossy banks and in boggy places were found to be especially abundant. Some of these were found to be parasitic on mosses in boggy places. Having collected and studied the cup-fungi in the middle West and East, I was impressed with the number of species common in the Rocky Mountains which were different from the common species collected in other places. This difference would depend partly on the climate at high altitudes, where most of the collections were made, many of the species probably being arctic or subarctic species. It would also depend in part on the different kinds of higher plants which give rise to the substrata for fungi, and this again is probably indirectly governed by the climate.

In addition to the fungi collected in the mountains, a number were collected on the plains about Denver. No actual count has been made, but as nearly as can be estimated from the various collections, about nine hundred specimens were brought home. While few of these specimens have yet been studied microscopically, I have every reason to believe that such study will furnish many points of interest to our knowledge of North American mycology, and possibly furnish some species new to science.

I wish here to acknowledge my indebtedness to Professor Bethel and also to my brother, Mr. Arthur G. Seaver, both of whom did all in their power to make our stay in Colorado both pleasant and profitable.

FRED J. SEAVER,
Director of the Laboratories.

CONFERENCE NOTES.

The first conference of this academic year met in the library on Wednesday, November 2, and in the absence of Dr. N. L. Britton and Dr. W. A. Murrill, was presided over by Dr. Arthur Hollick. The following discussions were offered:

Dr. Arthur Hollick exhibited a fruit of *Ficus* sp., from the Cretaceous (Laramie) of Converse County, Wyo., sent for identification by Mr. Charles H. Sternberg.

This is the first specimen of a *Ficus* fruit reported from the Laramie formation, which is upper Cretaceous, and is an undescribed species. A few have been found in the Dakota formation, which is lower Cretaceous (*F. neurocarpa* Hollick, Bull. Torrey Club **30**: 104. *fig. B 1*. 1903) and Mr. T. D. A. Cockerell has recently described one from the Tertiary shales of Florissant, Col. (*F. Bruesi* Cockrl.).

These discoveries now give us the ancestral history of the genus from the lower Cretaceous through the Tertiary to modern times.

Fossil leaves referred to the genus have been known from all these formations, but the identity of many of these was questioned. The discovery of the fruits however show that the determination of the genus from the leaves alone was correct.

Mr. F. D. Kern spoke on the rusts of red and white clover. He showed that until recently the rusts affecting these two common economic plants have been considered as belonging to the same species, but that there are really two morphological species. The chief differences are in the urediniospores. Aside from the morphology there are also undoubtedly differences in the habit or life-histories of these species. The subject will be discussed by Mr. Kern in a paper soon to appear.

Mr. Norman Taylor discussed temperature as a factor in local distribution of plants. In attempting to arrive at some conclusion as to the effect of temperature on the distribution of the plants growing within one hundred miles of New York, many interesting problems have arisen. The most obvious method of taking the annual mean temperature as a basis of calculation comes to nothing, as the differences in this are too slight to account for the very different vegetation in the Catskills where the mean temperature is 45°, and at Cape May, N. J., where the mean temperature is only 53°. The comparative similarity in the temperatures of the two places mentioned does not begin to express the great dissimilarity in the vegetation.

Following the method used by some investigators of similar

problems who have held that the average maximum temperatures were the controlling factors, these were taken. But here again the comparative equality could offer no satisfactory solution, as in both places the maximum was about 90°.

Reversing the process, and taking the average minimum temperatures, a procedure followed by still others, netted more suggestive results. The differences here were considerable, as the average minimum at Windham in the Catskills is — 12°, while at Cape May in southern New Jersey it is 8°, a discrepancy of about 20°. This, however, is vitiated by the protective nature of the snow blanket which covers the colder region for the greater part of the winter; an advantage lacking in lower New Jersey, where, however, the increased temperatures during winter about equalize matters. Then, too, it has been shown that seeds can stand artificial temperatures enormously lower than are ever found in nature, so that plants which rely on their seeds for perpetuation must be indifferent to any natural minima. Against this average minimum temperature as a delimiting factor in the distribution of our local plants, is the protective dormancy of all the woody plants in the region, during the cold weather. These objections are sufficient to render the theory incompetent, and it was abandoned.

Merriam's "life zones," an attempt to plot out the more prominent belts of animal and vegetable life in North America upon the basis of temperature, was found to come more nearly to the known facts of the distribution of our local plants, than any of the above hypotheses. But while its general principles were found to hold good, the difficulty of using a scheme of continental scope upon a limited area was such that accuracy seemed unlikely.

Many investigators have thought that some method of using the accumulated temperatures of a part of a season, or of all of it, would throw some light on the problem, but the dangers here are many and have been well summarized in Warming's "Oecology of Plants," page 26.

At the suggestion of Dr. C. Stuart Gager a new phase of the problem was then investigated. The method of the Department of Agriculture in their work on the acclimatization of wheat

furnishes the basis of what, it is believed, will be the solution of the problem. They have shown that wheat, transported from one part of the country with a known length of growing season, to an adjacent part with a slightly shorter growing season, will thrive very well. And if this process is continued with places having a progressively diminishing growing season, wheat may finally be grown in a country that would not have grown it if it had been transported the whole distance at the initial move. In other words they have successfully proven that the length of the growing season has a more profound influence on plants than any other temperature factor. Dr. Gager suggested that this factor be reduced to some working basis for the plants in our local flora range. With this in mind sixty-three different points within the hundred-mile radius were taken and the length of the growing season determined for each. This was done by adding the number of days between the last killing frost of spring and the first killing frost of autumn. Only places where there were complete records for ten years or more were selected. The results have been instructive and suggestive as there is a difference of more than one hundred days in the length of the growing season between the Catskill region and southern Jersey. At Windham the season is one hundred and twenty-three days: at Cape May two hundred and twenty days. Some of the places in the high mountains of New York and Pennsylvania have shorter seasons than Windham. Furthermore it has been possible to separate the whole region hereabouts into two fairly well marked climatic areas. One has a growing season of one hundred and fifty-three days or less, and is the country that contains the northern plants; while the other has a growing season of one hundred and sixty-three days or more (usually much more) and contains the more southern plants.

Taking the pine family it was found that the red pine, the white spruce, and the fir had never been discovered outside of the first of the regions mentioned above, that is, they have never been detected growing in a region with a growing season of one hundred and fifty-three days or more. It is proposed to plot out the distribution of all the species in the range, giving the

extreme variations of their growing season, with an indication of what is their predominately favorable length of season.

Mr. Nash exhibited a plant of *Paphiopedilum Fairieanum*, which was described by Lindley in 1857 from material said to have come from Assam. It was quite common in cultivation in Europe for some years after its introduction, but by about 1881 it was considered a very rare plant, the plants, probably owing to ignorance as to its habitat, slowly dying, until but a few individuals were left. The large nursery firm of Sander & Sons sent out a collector about 1894 to seek for it in the Khasia and Jaintia hills, but without success.

The horticultural world was startled in the early part of 1905 by the announcement in an Indian horticultural paper that the long lost orchid had been rediscovered, but by whom and where this discovery had been made was kept a secret. The announcement was at first doubted, but it was finally established that the plant had really been rediscovered by G. L. Searight, an engineer, on duty in the valley of the Torsa or Amuchu River in the Chumbi district of western Bhotan. For the first thirty or forty miles of its course this river flows through rugged mountains, and it was here, in the niches of gneissic cliffs, that this dainty little plant had its home. Here, exposed fully to the sun and air, at altitudes estimated at from 3,000 to 7,000 feet, this plant thrived. Ignorance as to its needs, so unusual among most of the members of this genus, may well excuse the failures in its first advent into cultivation. Now that its peculiar habitat is known better success is being attained with it. This species represents the northern extension of the genus, reaching about latitude 27, even further north than *Paphiopedilum insigne*.

The plant has always had the reputation of possessing a weak constitution, due perhaps to ignorance as to its habit which resulted in errors in cultivation. Its individuality is marked, however, for in the many hybrids, in which it has figured as one of the parents, its characteristics have been strongly impressed. It has again become a plant common to many collections, and will probably form the basis now for much more hybrid work in this interesting genus.

Mr. Fred J. Seaver spoke briefly on the number of apparently diseased plants which have been referred to the Garden during the past season in which the injury was caused by "red spider" rather than fungi. One of the means of checking this insect is to spray with water and keep the air moist. It would seem probable that the prevalence of this insect during the past summer might be due in part to the dry weather, this acting indirectly on the development of the insect and directly through its weakening effect on the host. FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. Arthur Hollick, curator, has been granted leave of absence for the purpose of studying and reporting upon paleobotanical material collected by him in Alaska in 1903, under direction of the U. S. Geological Survey. He plans to be in Washington at the U. S. National Museum until May 1, 1911.

Dr. W. A. Murrill, assistant director, returned from Europe, November 20. During his absence of seven weeks, he examined all of the collections of gill-fungi from tropical America in the herbaria at Copenhagen, Upsala, Stockholm, Berlin, Paris, and London.

Dr. Melchior Treub, who from 1885 until his retirement last year, was director of the well-known botanical garden at Buitenzorg, Java, and director of the Department of Agriculture for the Dutch East Indies, died at Saint-Raphaël, Var, France, on October 3, in the fifty-ninth year of his age. Dr. Treub besides editing the important Annales du Jardin Botanique de Buitenzorg since 1885, had published many noteworthy botanical papers, covering various phases of the science.

The daily papers of October 27 announced the death, on October 26, on board the steamship Lake Manitoba en route to Liverpool, of David Pearce Penhallow, Sc.D., MacDonald Professor of Botany at McGill University, Montreal. Professor Penhallow's principal line of work in recent years was in morphology, both of fossil and living plants, but he was also actively interested in

general botany, horticulture, forestry, ethnology and social science.

Meteorology for October.—The total precipitation recorded for the month was 2.38 inches. Maximum temperatures were recorded of 86° on the 6th, 82° on the 10th, 78° on the 17th, and 74° on the 27th. Also minimum temperatures were recorded of 45° on the 8th, 33° on the 13th, 38.5° on the 24th, and 29° on the 31st.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

128 specimens for the local flora herbarium. (Given by Mr. K. K. Mackenzie.)

25 specimens of lichens from Austria. (Given by Dr. A. C. Herre.)

150 specimens, "Hepaticae Europaeae Exsiccatae," series VI.–VIII. (Distributed by Dr. Victor Schiffner.)

4 specimens of hepatics from Oregon and California. (By exchange with the United States National Museum.)

2 specimens of hepatics from Vermont. (Given by Dr. M. A. Howe.)

3 specimens of *Viola Egglestonii.* (Given by Professor Ezra Brainerd.)

68 specimens from Maine and Alabama. (Given by Mr. K. K. Mackenzie.)

2 specimens of *Orthotrichum.* (Given by Mr. George E. Nichols.)

93 specimens from the eastern United States. (Given by Mr. J. J. Carter.)

6 specimens of *Prunus* from Washington, D. C. (Given by General T. E. Wilcox.)

4 specimens of mosses from Washington. (Given by Mr. George E. Nichols.)

25 specimens, "Fungi Utahenses," fascicle 8. (Distributed by Professor A. O. Garrett.)

2 specimens from the Bahamas. (Given by Mrs. Alice R. Northrop.)

4 specimens of *Salix.* (Given by Mr. K. K. Mackenzie.)

PLANTS AND SEEDS.

330 plants for Aquatic Garden. (Purchased.)

10 cactus plants. (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

14 orchids for the conservatories. (By exchange with Mrs. Meiere.)

1,340 tulip bulbs. (Purchased.)

Azolla plants from Holland. (Given by Prof. J. B. Smith.)

1 *Erythrina* from southern Africa. (Given by Mr. J. D. Beck.)

1 *Harperella vivipera.* (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

1 *Agave americana.* (Given by Mrs. Schuyler.)

2 plants for conservatories. (Given by Mrs. Stransky.)

23 orchids. (Given by Mr. F. R. Newbold.)

3 plants of *Echeveria.* (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

5 plants for the conservatories. (Given by Mr. W. H. Bickelhaupt.)

11 plants of *Opuntia.* (By exchange with Dr. D. T. MacDougal.)

25 plants derived from seeds from various sources.

1 packet of seed of white strawberry from Constantinople. (By exchange with Dr. D. T. MacDougal.)

2 packets seed from southern Africa. (Given by Mr. J. D. Beck.)

1 packet seed of *Viburnum.* (Given by Mr. Samuel E. Rusk.)

32 packets Cuban seeds. (Collected by Dr. N. L. Britton.)

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Docent

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JOHNS HOPKINS BOTANISTS AT CINCHONA.

The residence and laboratory at Cinchona were occupied, during June and July, 1910, by a party of six botanists. The party consisted of Professor Duncan S. Johnson, Messrs. W. H. Brown, A. R. Middleton, L. W. Sharp, and H. H. York, from Johns Hopkins University and Professor S. H. Derickson, of Lebanon Valley College. Cinchona was also the headquarters, for several days in June, of three zoölogists from Johns Hopkins, engaged in collecting dragonflies, phosphorescent coleoptera, and parasitic copepods. The botanists were engaged in researches on the ecology and seed-development of the Piperaceae; on the seed-development, germination and relation to the hosts of ten or twelve native species of Loranthaceae; on the cytology of lichens; on the seed-development of the Orchidaceae and Amaryllidaceae; and on the reproductive cells of the liverworts. The unusual delay in the coming of the rainy season gave abundant opportunity for field work. In the studies made at Cinchona and the amount of material preserved for study elsewhere, the stay at Cinchona proved highly satisfactory to the workers and it is believed will prove of importance to science when the researches there begun are completed.

During the stay of the Hopkins party on the island, Mr. William Harris, Superintendent of Public Gardens and Plantations, was helpful to the members in many ways. Mrs. Harris, who was stopping at Cinchona, took charge of domestic arrangements at the residence and thus left the investigators free to devote themselves entirely to botanical work.

The equipment at Cinchona has been increased lately by the addition of new chairs, stools, and Rochester lamps for the laboratory and of a cookstove, mattresses, and china for the residence. These articles have been given by parties from the Desert Laboratory and from the Johns Hopkins University that have recently visited Cinchona.

During this, the writer's third visit to Cinchona, he has become still more convinced of the peculiarly advantageous location of Cinchona as a tropical botanical laboratory. It not only offers a laboratory in a stimulating climate, within half a day's ride of a varied montane rain forest, of steaming lowland valleys, and of dry coastal deserts; but it is also located in an island with a stable government, good roads, an English-speaking population, and within four and a half days from New York, and nearby Atlantic ports.

DUNCAN S. JOHNSON.

JOHNS HOPKINS UNIVERSITY.

ORGANIZATION MEETING, NORTHERN NUT-GROWERS' ASSOCIATION.

A meeting was held in the museum building on November 17, for the purpose of organizing an association devoted to the interests of nut-growing. The meeting was called to order shortly after 2 P.M. by Dr. N. L. Britton, who welcomed those present and wished them success in their undertaking. During his remarks he referred to a recent visit to Cuba, where he succeeded in collecting nuts of the Cuban walnut, *Juglans insularis* Griseb. Specimens of these were exhibited, and some of them presented to Dr. R. T. Morris for his collection of edible nuts of the world, deposited at Cornell University.

Dr. W. C. Deming was made chairman of the meeting, and a temporary secretary was elected. The chairman read a number of letters from various parts of the country, expressing an active interest in the formation of an organization such as was proposed. A committee of three was appointed by the chair to draft a constitution. This committee, consisting of Mr. John Craig,

Dr. R. T. Morris, and Mr. T. P. Littlepage, submitted a report recommending that the name of the organization be the Northern Nut-Growers' Association, that residents of all parts of the country be eligible to membership, and that the officers be a president, a vice-president, and a secretary-treasurer. An executive committee of five was also provided for, two of said committee to be the president and secretary-treasurer. The annual dues were placed at $2.00, and life membership at $20.00. The recommendations of the committee were adopted.

An interesting exhibition of nuts, and specimens illustrating methods of grafting, formed a feature of the meeting. Chestnuts, walnuts, and hickory nuts, including the pecan, were illustrated in much variety. Mr. T. P. Littlepage had a series of nuts of the pecan which he had collected from a number of selected trees in Kentucky and vicinity. One of these, almost globular in form, was of particular excellence, being of clean cleavage and delicious flavor.

Dr. R. T. Morris was elected president; Mr. T. P. Littlepage, vice-president; and Dr. W. C. Deming, secretary-treasurer.

GEORGE V. NASH.

AN OPPORTUNITY TO STUDY THE ORIGIN AND DEVELOPMENT OF A TROPICAL FOREST.

The Blue Mountain Region of Jamaica experienced during November and December, 1909, a number of days in which the rainfall was far greater than any before recorded for the island, and probably greater than any that has occurred in the same length of time during the past century.

The effect of the disastrous floods, consequent upon this unprecedented rainfall, on the plant covering of the region about the Cinchona Tropical Station of the New York Botanical Garden is well worth recording. Such a record will not only be of interest in giving an idea of the immense changes wrought by these floods but also in suggesting the rare opportunity here presented for studying the extremely interesting problem of the recovering of a virgin soil with new vegetation.

That the effects of the rains were very great is evident even to the casual observer, who looks out from Cinchona over the surrounding country. Not only were scores of acres of coffee fields stripped to the bare rock but the native vegetation of large areas of the steep mountain sides was washed down into the valleys, and even the primeval forest of the valley bottoms was swept out and carried down to the sea. The south slopes of the Blue Mountains, eastward from Cinchona, are now marked with great gray scars where a year earlier they were striped with young coffee trees or dark green with dense forest. Two examples will serve to clearly suggest the character and extent of the changes effected in the vegetation by the floods.

In 1903 and in 1906, the writer had visited the valley of the eastern branch of the Green River, just below Whitfield Hall Coffee Works, to collect species of *Piper* and *Peperomia* then growing there in abundance, in a dense forest which covered the valley from its steep western slope across the bottom of the valley to the coffee lands on the hills to the east. In June, 1910, this whole valley was a gray desert of broken rock and pebbles, from a quarter to half a mile in width and stretching from the gray cliffs at its head down beyond the junction of this branch with the western one of the Green River. Not merely were the shrubs and herbs of the forest floor gone, but the great trees, with their covering of epiphytes and lianes had disappeared completely. Some of these plants perhaps lie buried in the old bed of the stream but most of them were evidently washed down to the Yallahs River, and on twenty miles to the sea. Scarcely a bit of driftwood is to be seen along the edges of the valley. Great boulders, eight or ten feet across, have disappeared, having either been buried or rolled farther down the valley. One huge rock, 20 feet high, at the junction of the east and west branches of the river, stands crowned with a large tree that clings to the boulder by roots wedged in its cracks, suggesting what the former level of the forest floor was at this point.

The only plants that have gained a foothold in this stony waste. during the seven months following the flood, are scattered seedlings of the John Crow Bush, *Bocconia frutescens* L., and a few

other species from the surrounding hills, all of which latter species are rare compared with the *Bocconia*.

This steeply sloping valley bottom of hundreds of acres of new soil of broken rock ought to prove as interesting, from many aspects, as the island of Krakatoa as an area in which to study the occupation of a virgin soil by a new plant covering. Seeds of many species, and in considerable numbers, must be scattered over this valley yearly from the plants of the neighboring mountain sides, and species after species may be expected to establish itself beside the John Crow Bush, as larger and more numerous areas become fitted, by the gradual accumulation of soil and by the growth of other plants, to support the more exacting species.

A second region of unusual botanical interest that was greatly changed by the floods is the cloud-filled valley of the Mabess River, which tumbles downward north of Morce's Gap with a fall of about a thousand feet to the mile. This valley, at a point about two miles north of Morce's Gap, has, because of its lower altitude, a warmer and moister climate than Cinchona. It is filled with clouds for probably two thirds of the daylight hours during the year. Recent visitors to the Mabess Valley at this point reported the sides and narrow floor of the valley to be covered with the most luxuriant vegetation to be seen anywhere about Cinchona.* Shreve and others found the forest floor to the edge of the stream and the boulders in the middle of the stream carpeted with an herbaceous vegetation of mosses, ferns, orchids, Peperomias, and Pileas, and draped over the rocks and trees were Acrostichums, Lygodiums, Columneas and many other lianes. This was the condition of things in 1906. In June, 1910, the boulders in the middle of the stream and along its edges, which Shreve found covered with thick humus and supporting a luxuriant vegetation, were bare to a height of eight or ten feet above the stream. The whole stream bed up to this height, and therefore often for a distance of fifty feet back from the normal edge of the stream, is ground clean of all vegetation and of all relics of the former vegetation. There is left only a mass of polished boulders and broken pebbles. Only where

*See Shreve, F. A collecting trip at Cinchona. Torreya **6**: 81. 1906.

hanging lianes or fallen trunks with their loads of epiphytes drop over the cliffs, is any living vegetation to be seen below the high water mark mentioned.

Here again botanists have an opportunity such as is rarely presented to them, of studying the occupation by plants of an area in which all the conditions for plant life except a soil are present to a nearly optimum degree. It seems safe to predict that the reoccupation of this denuded area, especially of the tops of the boulders, by even the first plants, will necessarily be slow. The accumulation of a humus to support a vegetation such as that described by Shreve will probably take centuries. This latter suggestion offers a comforting assurance of the infrequency of floods of this disastrous character. It likewise indicates the length of time through which the study of the reinvasion must be studied.

DUNCAN S. JOHNSON.

JOHNS HOPKINS UNIVERSITY,
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NOTES, NEWS AND COMMENT.

Professor H. L. Bolley, dean of the department of biology in the North Dakota Agricultural College, called at the Garden recently on his way to Washington to attend a meeting of the Association of American Agricultural Colleges and Experiment Stations.

The collection of lady-slippers, or Venus-slippers, represented by the genera *Paphiopedilum* and *Phragmipedium*, are now in full bloom. These are located in houses 12 and 14 of conservatory range no. 1. A great part of these are from the collection of Mr. Oakes Ames, who presented his large orchid collection to the garden in 1907. Some very interesting color-variations are represented in the yellow forms of *Paphiopedilum insigne.* These are in house no. 15, and should be compared with the type forms in house no. 12.

A specimen of the "Hottentot's head," *Stangeria eriopus*, in conservatory range no. 2, New York Botanical Garden, is now bearing

a cone for the second time. This species of the cycad family is a native of southern Africa. *Stangeria* differs from all the other genera of cycads in having the leaf-segments pinnately-veined instead of parallel-veined, and its venation so much resembles that of some ferns that this plant was originally described many years ago as a *Lomaria*. As many of the fossil plants of the coal measures, first supposed to be ferns, have recently been shown to be more nearly related to the cycads, this living genus is of particular interest.

In conservatory range no. 1, are specimens of plants from which three of the most important beverages are derived. In house no. 13 the tea plant, *Thea sinensis*, is in flower. It is from the young leaves of this plant that tea is made, the different kinds depending upon the manner of drying and preparing them. In house no. 4 are two other beverage plants, coffee, *Coffea arabica*, and chocolate, *Theobroma cacao*, both now in fruit. The two seeds in the red berries of coffee are the coffee-beans of commerce; and the numerous seeds, arranged in five rows, in the large pods of the *Theobroma* are the chocolate beans.

Meteorology for November.—The total precipitation for the month was 2.83 inches. Maximum temperatures were recorded of 65° on the 2d, 62° on the 10th, 54° on the 18th, and 60° on the 24th. Also minimum temperatures were recorded of 29° on the 1st, 21° on the 21st, and 29° on the 23d.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

346 specimens of flowering plants and ferns from St. Domingo. (Collected by Baron Hans von Türckheim.)

167 specimens for the local herbarium. (By exchange with Mr. Harold W. Pretz.)

4 specimens of *Salix* from Maine. (Given by Mr. K. K. Mackenzie.)

2 specimens of mosses from Connecticut. (Given by Mr. George E. Nichols.)

37 specimens for the local herbarium. (Given by Mr. K. K. Mackenzie.)

3,000 specimens from North America. (By exchange with the United States National Museum.)

3,500 specimens from Cuba. (Collected by Dr. and Mrs. N. L. Britton, Mr. F. S. Earle and Dr. C. Stuart Gager.)

83 specimens of mosses from Oregon. (By exchange with the United States National Museum.)

1 specimen of *Leucobryum* from Illinois. (Given by Mr. W. W. Calkins.)

8 specimens (types) of mosses. (By exchange with Mr. Jules Cardot.)

22 specimens of flowering plants from Maine, South Carolina and Alabama (Given by Mr. K. K. Mackenzie.)

PLANTS AND SEEDS.

12 cactus plants for the conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

1 plant of *Tillandsia* from Argentina. (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)

5 plants of *Zamia* from Herradura, Cuba. (Given by Mrs. F. S. Earle.)

1 *Castanea sativa.* (Given by Dr. W. C. Deming.)

1 *Bourgainvillaea.* (Given by Mr. F. R. Newbold.)

1 plant of *Salvia leucantha.* (By exchange with Board of Park Commissioners, Rochester, N. Y., through Mr. John Dunbar.)

1 maple plant. (By exchange with Vassar College, through Mr. Wm. Stopher.)

349 plants for hardy collections. (Purchased.)

1 packet seed of *Gentiana crinita.* (Given by Mrs. F. E. Curtis.)

1 packet seed of *Passiflora laurifolia.* (By exchange with Public Gardens, Jamaica, W. I.)

1 packet seed of *Cereus Bonplandiana.* (By exchange with U. S. Nat. Museum, through Dr. J. N. Rose.)

1 packet seed of *Paurotis Wrightii.* (Collected by Dr. N. L. Britton.)

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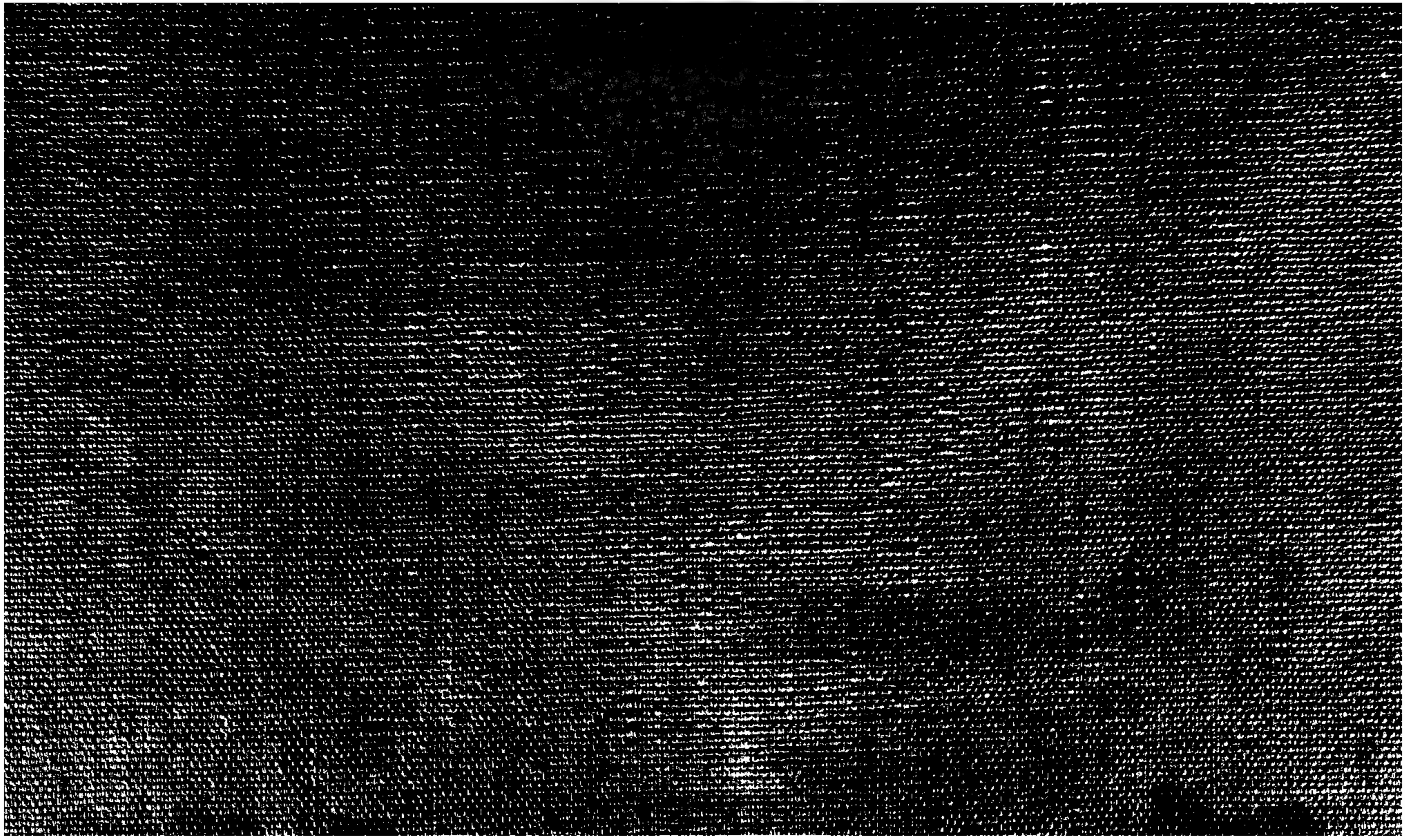

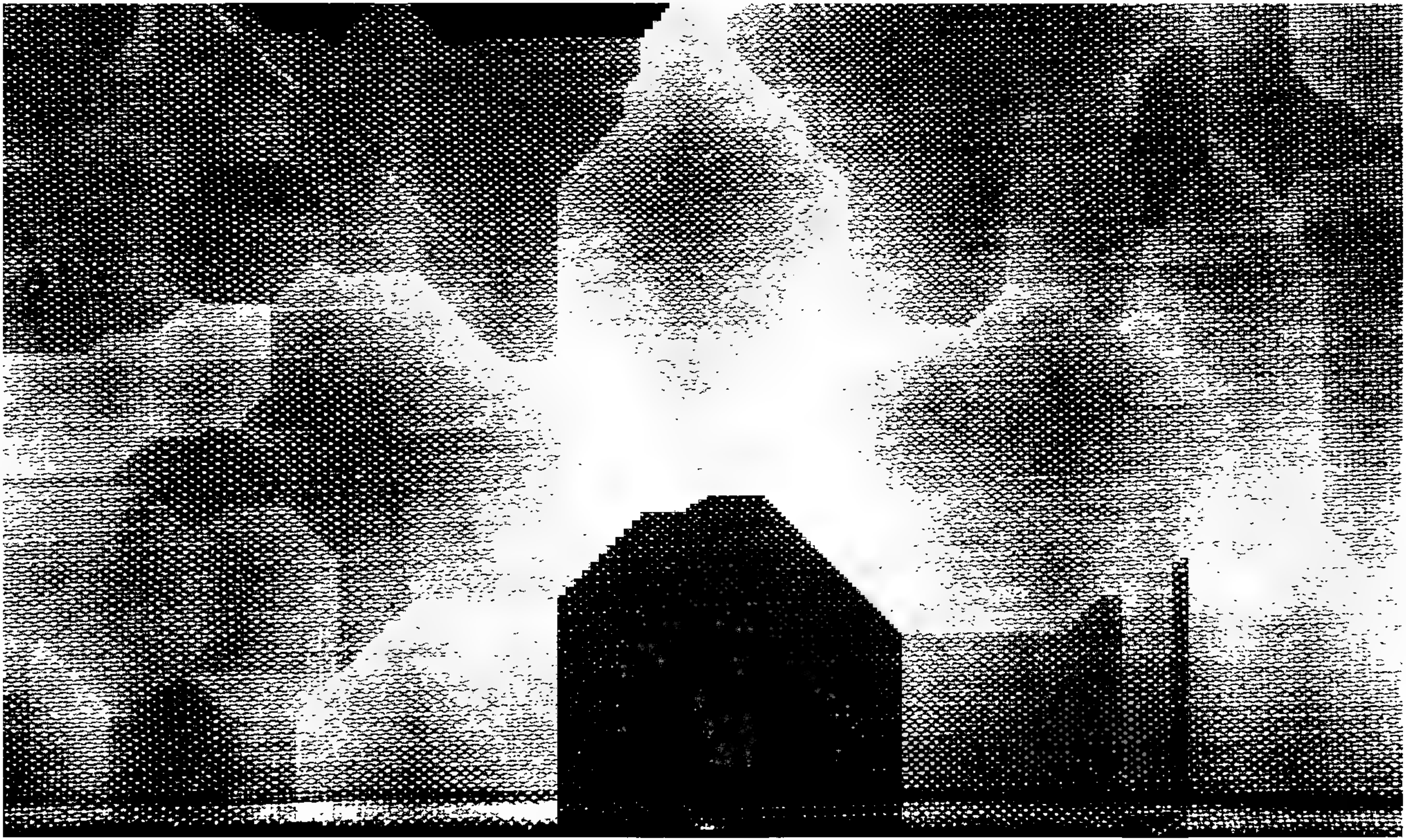

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SOME USEFUL PLANTS OF MEXICO.*

One who would investigate the vegetable products of Mexico must establish his base of operations in the public market places, preparing there his list of subjects for investigation, and obtaining there such information regarding them as may direct his further search. The "mercado," or "ricoba" as it is sometimes called in South America, is an institution of prime importance throughout the whole of Spanish America. The practice of keeping meats, vegetables, fruits and other country produce in isolated shops, then known as "tiendas," is coming more or less into vogue, mostly as a result of foreign population and influence, but it remains true that the only way in which a general idea of such products can be gained, is through a faithful attendance upon the mercados, where one is certain to find represented, throughout the different seasons, everything that occurs within the territories that are respectively tributary to them. He will find, however, that the information there to be gained is strictly limited. He will be reliably informed that a certain lot was produced in a certain place, but he can learn little about the distribution of the article elsewhere. He will be correctly informed as to its current names at that place, but if he subsequently encounters it some hundreds of miles distant, he is not only almost certain to hear one or more different names for it, but he is very likely to find the same name applied to an entirely different article. Thus, the late Dr. José Ramirez has published

*Abstract of a lecture delivered at the New York Botanical Garden, November 12, 1910.

a large work on the botanical and common names of Mexican plants, which I have found of very little practical use when travelling widely over the republic. Undoubtedly, the author's work was carefully and laboriously done, and the observations recorded are accurate, but the result is invalidated by the effects of provincialism, in the manner stated.

When the student undertakes to secure information concerning the character of the plants yielding the products, he finds the results exasperatingly vague, and even contradictory, and when he contemplates visiting the source of supply to obtain this information, he is appalled by the distances to be covered, and by the many different directions in which they lie. It is a most common occurrence for these Indians to travel on foot for a

FIG. 1. Visiting the Source of Supply.

hundred or a hundred and fifty miles to bring their fruits to market.

It might be supposed from this that these products would be widely, or even generally distributed in commerce, but such is far from being the case. On the contrary, provincialism is in no other way so strikingly manifest as in the local distribution of the cultivation and trade in particular articles or varieties of them. I dare say that one who has spent a long life in Mexico,

who has travelled much, and who has been attentive to the products, would be almost certain to see something entirely new to him, probably a number of such articles, on visiting the market of a distant town.

It thus happens that a surprisingly large number of important vegetable products of Mexico are botanically either wholly unknown, or known in the most general and indefinite manner, and that it is exceptionally desirable that all travellers should unite in collecting specimens and information, even though only in a very fragmentary way. Even a leafy branch without flowers or fruit, or a photograph, with suitable notes, may prove the means of clearing up some long existing doubt as to the identity and source of a very important product. It is to be remembered, in this connection, that the value of these products is often far from being local. Many of them are capable, either in their natural condition, or after easy culture-improvement, of being favorably received in the markets of the world.

It is with this idea that the present contribution is presented. It is in no sense a synopsis of Mexican economic botany, but strictly what its title implies, remarks on "Some Useful Plants of Mexico," these plants being such as have claimed my special attention while travel ing there.

On the subject of drugs, I will merely touch. Native Mexican drugs are a legion. Aside from the fact that the subject is not one of popular interest, it would require a volume for its treatment. Having here an illustration of a species of *Argemone*, a member of the poppy family, I will remark that I expect the oil of the seeds of this genus to some day become an important article of commerce. Aside from the fact that it has excellent medicinal qualities, it is likely to subserve many of the other uses of fixed oils. *Argemone* is represented in Mexico by many species or varieties, and it grows most readily and abundantly.

Most of the food-plants of Mexico, being those of cultivation, and well-known elsewhere, will not receive attention, but I will refer to several interesting novelties in this field.

The use of the young shoots of Oriental bamboos for food is well known, so that I was interested in observing that the

young shoots of the species which I encountered on Limon Mountain, 160 miles south of Mexico City and about 55 miles from the Pacific coast, possess excellent edible properties, though I did not learn that they are so used. These shoots, from 12 to 18 inches in length and nearly an inch in greatest thickness, resembled asparagus shoots, except that they tapered regularly from the base to the acute summit and that the scales were closely appressed. They were very tender and crisp, starchy and of a rather neutral flavor, these being valuable qualities for a staple food.

On this same mountain side, I found numbers of the small trees here represented, belonging in the Acacia group, but as yet undetermined by me. The Indians informed me that the partially opened leaf-buds of this tree, six inches or more in length and nearly an inch in thickness, are edible. I tried some of them in the raw state, and found them tender, sweetish, though decidedly astringent, and evidently quite nutritious.

The small nut-like fruits of a number of palms are important commercial articles in most markets, some being used for the expression of their oil, others for food. It is quite evident that the same individual names, in different localities, represent different species and even different genera.

I think that everyone who has ever cultivated dahlias must have been struck by their enormous productiveness in roots, and many, like myself, must have wondered if it were possible to utilize them for food and wished that such might be the case. Being closely related to the highly nutritious and delicious Jerusalem artichoke and, like it, richly charged with inulin, there can be no question as to its availability as a food, if free from disagreeable and deleterious properties. Various species of dahlia are exceedingly common and abundant in the mountains of Mexico. In the lava beds between Mexico City and Cuernavaca, where this picture was taken, they cover acres, the beautiful flowers representing every shade of color from yellow, through orange, salmon and vermilion to scarlet, mauve, lilac and rose. Upon one of my trips I was accompanied by a native who was remarkably well versed in the native uses of the plants. As I

was in the act of collecting a specimen of dahlia flowers, he astonished and delighted me by informing me that its root was eaten. In order to test him, I professed great incredulity and even made sport of his statement, whereupon he most earnestly and somewhat indignantly ran and pulled up a bunch of roots

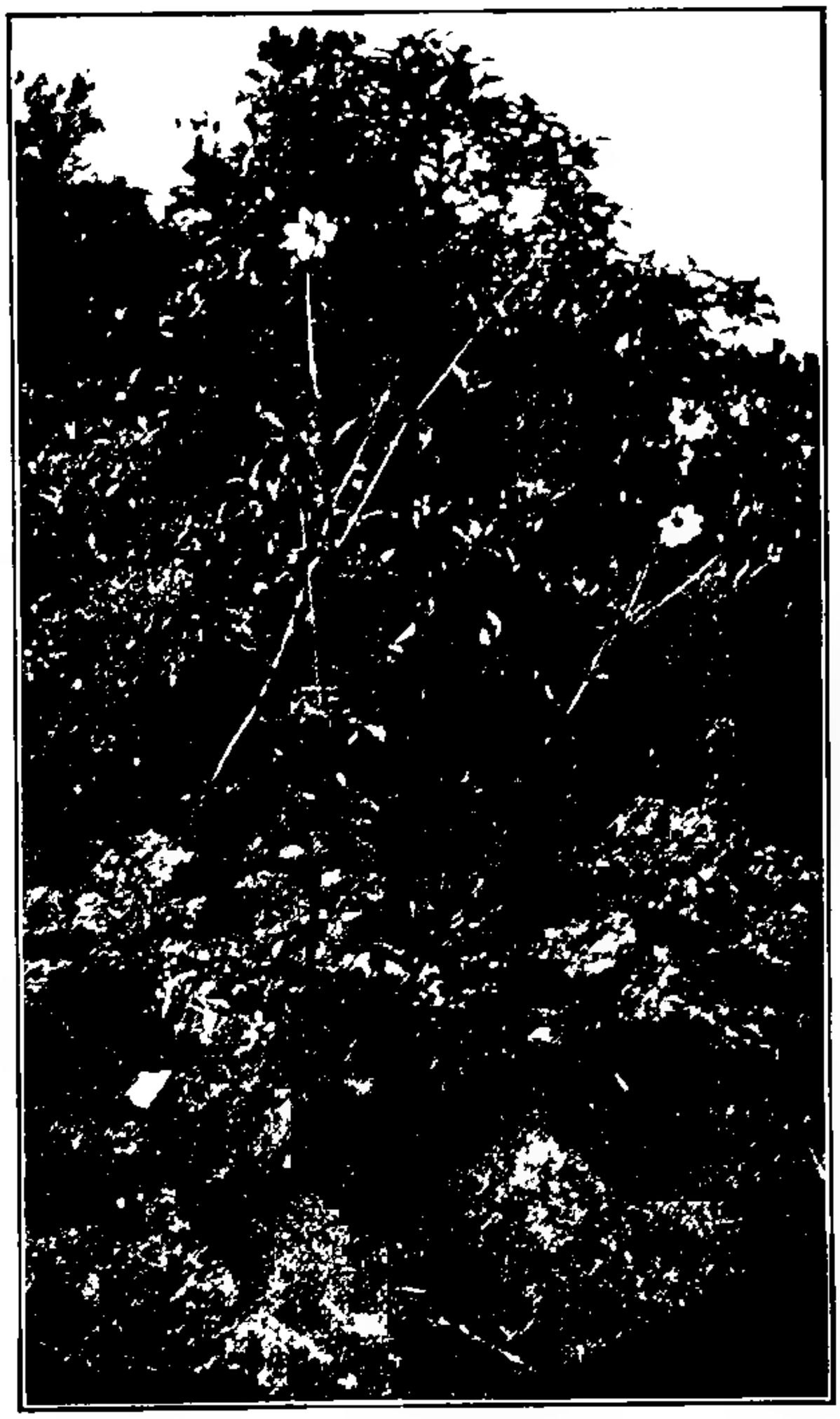

FIG. 2. Dahlias in Lava Bed, near Ajusco, Mexico.

and insisted that they were eaten by his people. I consider this not only a very interesting but economically a most important subject for investigation.

The century plants, or magueys, one species of which is here represented, are noted rather as beverage plants than as food plants. Their use for such purposes, as well as for their fiber, is pretty well known, and is much too extensive to be discussed at

the present time, but I wish to refer to the use of the enormous heads or buds, just previous to flowering, and trimmed of their projecting leaves, for food. They are placed in pits or ovens and baked or roasted for many hours. On being removed, they are of a rich deep-brown color, their form being perfectly preserved, and very sticky with the exuded sugar. I have frequently seen them for sale in the market places, of great size and I should think weighing as much as 200 pounds. They are either sold entire or the immense scale-like leaf-bases are pulled off and sold separately. As a food, this article is to be regarded rather as a sweet preserve.

Other curiosities in the line of native foods are the large fleshy roots of *Prionosciadium diversifolium* Rose, which I encountered on Limon Mountain. These roots in size and form reminded me considerably of those of spikenard (*Aralia racemosa*). I was informed that the natives cook and eat them as we do parsnips and carrots.

Various species of fungi are collected in Mexico for home use or for sale in the markets as food. I purchased in this way *Collybia dryophila*, from some Indian women while collecting it in the mountains near Toluca, and a rather large species of puff-ball in the market of Mexico City.

Another curiosity was the sale in the Mexican City markets of the herbage of a purple-flowered species of *Oxalis*, looking not unlike *O. Acetosella*. It is used as an ingredient of salads and is said to be eagerly bought by Mexican epicures. I afterwards saw the natives collecting it on the banks by the roadside, where it completely carpeted the soil, consisting of partially decayed rock. I have not yet had time to determine the species.

In the market of Queretaro, I was surprised to see the common purslane (*Portulaca oleracea*) regularly sold as a culinary vegetable. For one cent, equal to half a cent of our money, I purchased as much as could be crowded into a quart jar, and, being a *gringo*, I was doubtless cheated.

It is worthy of note that I found growing in the rich soil among rocks at the foot of a cliff near Cuicatlan, Oaxaca, a very small species of *Solanum*, bearing tubers. So far as I have

been able to determine, this is an undescribed species. It bears pure white flowers and its very small tubers are white and translucent.

The genus *Physalis* is well represented in Mexico by wild species, many of which contribute edible sweet fruits, besides which there are several cultivated varieties, their specific identity very uncertain, which contribute vast quantities of so-called

FIG. 3. Lava Beds Covered with Fern Growth, near Ajusco, Mexico.

"tomaties." These are mostly not sweet, but rather highly flavored and are used as ingredients of various dishes.

To the edible fruits of Mexico, I must give special attention.

Passing over the better known fruits, such as apples, pears,

quinces, strawberries (which are supplied in the restaurants throughout the entire year), oranges, bananas, cherimollas and other anonas, I shall confine myself to those which are less known and therefore of greater interest in a contribution of this kind. Before doing so, however, I wish to mention a peculiar pineapple which I purchased in the market of Oaxaca. Although small, knotty and ugly in appearance, it possesses a remarkable fragrance and flavor and is sweet and rich beyond any other that I have ever eaten, unless possibly the very large and handsome fruits of the Guayaquil market. I should also like to comment upon the remarkable variety observed in the aguacates, or alligator pears, of Mexico. One of the extremes is a nearly spherical fruit not so large as a hen's egg and having the rich purple color of the egg-plant, or darker. The other is a pear-shaped fruit, with very long neck and weighing two or three pounds. Between these extremes we have all combinations of color, form and size. Those who purchase this fruit will find it economical to select the long-necked varieties, as the neck is composed of solid meat, the very large seed being confined to the larger end.

The Zapotes of Mexico are varied and of the greatest interest. Some of them belong in the genus *Sapota*, or the closely related genus *Lucuma*, while others are in widely separated families. "Zapote blanco," or white zapote, is a delicious sweet fruit, resembling a roundish pear, of a green color, with a thin skin and white flesh and containing usually five large seeds. Strange to say, it is credited to the rue family. "Zapote negro," or "Zapote prieto," on the contrary, is a persimmon. Most of us are familiar with our own native persimmon, the pulp of which is of a deep-brown color, and with the Japanese species, or "kaki," which much resembles a good sized tomato and has red or orange pulp. The black zapote here considered resembles the kaki in form but is two or even three times as large, of a deep green color externally, and the pulp of almost inky blackness. Like other persimmons, it is rather dry and wanting in flavor, though sweet. There is a record in the medical college of Mexico City of an unpopular professor having been changed in color from head to foot as a result of a fusilade with these fruits by his disgruntled disciples.

"Zapote borracho," meaning drunken or bloated zapote, is really a very delicious fruit. It is ovoid-pear-shaped, smooth and green, without, and with a very deep yellow pulp in which are imbedded several large seeds. The pulp is very sweet and of a peculiar and delicious flavor. I judge that it is a species of *Lucuma*. The two first-named zapotes were found in the market in late winter, about February, while the last-named was obtained in July.

One of the most important fruits native to Mexico is the "Nance agrio," or "Nance amarillo," meaning the sour or yellow nanchi. It is the product of the small Malpighiaceous tree *Byrsonima Karwinskiana* (not *B. crassifolia*, as stated by Dr. Rose in his "Notes on the Usfeul Plants of Mexico"). This tree seems to be exceedingly widely distributed throughout Mexico, and the ripe fruit seems to be in season, in different parts, throughout most of the year. I purchased it down near the Isthmus of Tehuantepec in February, and it was abundant in the markets of Guerrero in July. At the last-named period, I found trees in the mountains of Guerrero loaded with the green fruit of the new crop, with some ripe fruit, and still bearing a considerable quantity of flowers. The fruit almost exactly resembles an oxheart cherry, except that it is not at all flattened laterally and not indented at the base. It is of a light, bright yellow and contains a stone like that of the cherry. Its flavor is mildly sweet and sub-acid, and it has a characteristic and very agreeable strong flavor of its own and a deliciously agreeable fragrance. It is eaten raw and cooked in the fresh state and is dried for subsequent cooking.

Yet still more delicious, more closely resembling the flavor of a cherry, but far richer, is the "Nance dulce," or "Nance colorado," meaning sweet or red nanchi. This is far less common and abundant than the other. I encountered it only in Oaxaca. The tree is about as large as a cherry tree, and bears flowers and fruits at the same time, but two or three in a cluster, instead of in racemes like the other. The fruit is about twice as large as the other, of a beautiful red color and lightly and irregularly two or three lobed.

Very often when I have tasted the fruits of our common wild cherry (*Prunus serotina*, or *Padus serotina*, as it should be called), I have wondered if it could not be improved by culture and breeding so as to take rank as a cultivated commerical fruit. Once, my Adirondack guide informed me that he had found a tree bearing such unusually good fruit that he had transferred it to his garden, fertilized and cultivated it, and seen it develop cherries which burst open with their richness. Of all this I was reminded when a station peddler cried out his stock of "Capulinas dulces," which I quickly found to be a species of *Padus*, very similar to our *P. serotina*, but three times as large, and of delicious sweetness and flavor. It is *Padus Capulin*, mostly occurring wild, but frequently transferred to gardens, where it does not seem to be improved as I think it is capable of being. This fruit is ripe in July and August.

In one of my lectures here, I referred to the *Pacay*, an enormous bean-like fruit of the Andes. It is often more than a foot long, an inch and a half wide and half as thick, and contains eight to twelve large beans, like lima beans, imbedded in a pure white substance resembling absorbent cotton. This apparently fibrous mass is juicy and dissolves in the mouth like water-melon pulp, which it considerably resembles in flavor. It is the product of *Inga edulis*, a large tree in the Acacia group. There are many species of *Inga*, and most of them contain such an edible pulp. I found one in the Mexican markets, and traced it to Cuernavaca, where Mrs. Harry O. Robinson very kindly procured me specimens, from which I determined it as *Inga Jiniquil*. It is known by the common name Jiniquil, and is marketed in July and August.

One of the most delicious fruits that I encountered was purchased in Zamora in February. It is a *Bromelia*. Though I have no means of determining the species, it is probably *B. Pinguin*. The fruits occur in large heads like the fruits of a *Yucca*, but more densely arranged. Individually, they resemble small pink radishes, in size, form and color, though the shape is quite irregular. The fruit is firm and crisp, much like that of an apple, and is sweet, acid and delicious. From what is written of it,

it seems to be more acid at times, so as to be used in making a lemonade-like drink. I do not recall its native name, but if it is the species mentioned, it is called "Aguava," "Cardo," or "Timbirichi."

One of the most important commercial table fruits of Mexico is the grenadilla, which is a species of *Passiflora*, or passion flower. Having never seen its foliage or flowers, I am unable to name it specifically. In middle or late winter, it may be seen in bushels on all fruit stands. Its skin is rather hard and thick, like that of a gourd, and it contains a myriad of blackish seeds about as large as pearl barley grains, imbedded in a beautiful nearly colorless and transparent sweet jelly. This jelly may be sucked from the seeds and the latter rejected, though it is more common to swallow the mass entire like an oyster. In Bolivia I have seen one almost exactly similar, though rather smaller, of which the pulp is intensely sour like that of a lemon, and which is used for an acid drink.

Altogether the most interesting fruit which I encountered is one which is almost wholly unknown either economically or scientifically. It is exceedingly rare, even where it occurs, and appears to be in the process of extinction, and specimens of it in herbaria and other collections are almost non-existent. The genus *Mocinna* was described by Ramirez in 1894 in a Mexican government publication and is merely referred to in the Nachträge of the Pflanzenfamilien. I was exceedingly fortunate in finding at Empalma de Gonzales a single plant in flower and later one in fruit. Looking at the fruit as here exhibited, you would say that it had a short, stout, curved peduncle and five terete, rigid, horn-like or spine-like, erect, superior calyx teeth. When we see it attached, however, we find it inverted, the calyx-teeth being reflexed, the supposed peduncle a style, and the real peduncle extremely long and filiform, and the fruit pendulous. This remarkable fruit is classed with the papaw, or papaya, though to me it seemed more closely related to the passion flowers. It grows prostrate among rocks, its stems being very long and slender and much like those of the Cucurbitaceae. It bears no tendrils. The fruit is known as "Jarilla" and is greedily sought

by human beings as well as animals. It was not ripe when I found it, but it is said to be sweet and delicious.

On Limon Mountain, I found a very peculiar wild grape (*Vitis blanco* Munson), the leaves and young growth very white-woolly and the plant more inclined to form beds upon rocks than to climb high. The tendrils are very long and stout, shortly-branched and tender and juicy, and very much inclined to bear small bunches of flowers and fruits at the ends of these branches. The flowers are of a dull purple, several times larger than those of any of our own grapes, wild or cultivated, and thick and fleshy. The clusters, like the individual fruits, are very large, being short and broad, of a deep-purple red, and contain a few very large seeds. The pulp is characterized by being highly mucilaginous, very sour and intensely "foxy." So great is this acrid effect, that if a number of fruits are eaten, it will leave the mouth sore and almost bleeding. It seems possible that through hybridization some of the properties of this fruit might be advantageously incorporated into our cultivated varieties.

In the lava beds previously mentioned, and growing among the dahlias, I found a very large currant bush (*Ribes Pringlei* Rose), almost a small tree, of erect, pyramidal habit, which bore very large racemes of correspondingly large currants. The fruit was not ripe at the time, so I can say nothing of its character.

In the cañons of Oaxaca near Cuicatlan, I found another species of grape, in flower in February, and in July I found in the same locality a species of mulberry which is apparently not described. The tree is of small size and of dense growth. The foliage has almost the form of *Morus celtidifolia*, but is soft-woolly or hairy instead of rough. The fruit is small and short, having much the form and size of a large raspberry, of very few fruitlets, and of a pinkish-yellow color. Its sweetness is slight and it is rather insipid.

On Limon Mountain I collected a delicious sweet fruit resembling in appearance a deep blue olive, which proves to be an undescribed species of *Mayepea*, in the olive family.

One of the strangest pieces of information that I received

was that the most delicious berry-like fruit of the Gonzales district is that of a white flowered species of *Lantana*.

The so-called Mexican plums, or Ciruelas, known in the British West Indies as hog plums, are yielded by two or more species of *Spondias*, in the Mango family. I purchased in Mexico City in July, a very large, deep red variety, which appeared to me specifically distinct from both the *S. lutea* and *S. purpurea*.

Among the lava beds south of Mexico City, I one day in July purchased from an Indian vender a small basket of large black-

FIG. 4. *Plumiera rubra*, Limon Mt., Mexico.

berries, beautifully oval in form and structure, but not of very good flavor. I did not see the plant or its foliage, and could not identify the species.

Near Toluca I found a single clump of black-cap, or black raspberry bushes. It did not look much like either of our species, though it may be the very stout form of *R. occidentalis* that has been called variety *grandiflorus*.

Last year, I lectured on the Mexican rubber plants, giving attention to those of present commercial importance. On my last trip I took note of a number of others which have not as yet disclosed commercially important properties, but some of which are now undergoing practical experimentation.

Probably the most important of these is known in Oaxaca as "Mulatilla." It is a small species of *Euphorbiodendron*, the largest tree that I saw being only about four inches in trunk-diameter. It is said, in rare instances, to reach a diameter of a

FIG. 5. Palm, the Leaves used for Thatching in Guerrero, Mexico.

foot. The species is not described, and I purpose to describe it as *E. Mulatilla*. Its milk has apparently the same composition as that of *E. fulvum*, the "Palo Amarillo."

The milk of *Plumiera rubra* is said to be richer in rubber, though its quality is inferior. This tree is known in Mexico as Cacaloxuchil. It is widely distributed and sometimes has a trunk diameter of nearly a foot. The species is widely distributed

through tropical America, where some of the other species become large forest trees.

Jatropha urens, called in Mexico "Mala-mujer," is another small tree or large shrub, the milky juice of which contains some rubber, and which is widely distributed throughout tropical America. The entire tree, including both leaf-surfaces, is thickly beset with needle-like spines, which, besides being pungent, are poisonously irritant. Working with this plant, even for the making of herbarium specimens, is decidedly painful.

"Cordoban" is the local name in Oaxaca of a very peculiar small shrub known to botanists as *Pedilanthus Pringlei*. Its stems grow in clumps, are little branched, mostly from one to two yards long, about as thick as the finger, soft and full of milk, nearly leafless and droop or recline on other plants. Its peculiar little flowers, of a coral-red, are inconspicous. It is a near relative of the *Euphorbia*. Should it ever be found practicable to collect its rubber, it will probably be only by grinding up the entire plant.

A number of miscellaneous uses of plants may now be mentioned. The leaves of the palm here exhibited, possibly a *Thrinax*, furnish the roofing for a large part of the poorer houses of Balsas and other Guerrero towns. The leaves of a *Furcraea* furnish in the same district a considerable amount of fiber for rough cordage. "Jaboncilla" is a name applied at Gonzales to a very pretty little leguminous shrub, *Brongniartia* sp., with silky white foliage and large chocolate-purple flowers much like those of the sweet pea. It is so called because it can be used as a soap substitute.

When bananas ripen and the plants are cut down, their stems are cut into joints about a foot long, these joints being then hollowed out and the tough cylinders being slipped over ripe pineapples to protect them during transportation.

A small silk-cotton tree (*Ceiba* sp.) abounds in a large part of the mountainous plateau of central Mexico, and bears annually, in the aggregate, an enormous quantity of cotton-like fiber. attached, not to the seeds, as in ordinary cotton, but to the inside of the pod. This cotton is fine and of a beautiful silky luster,

There is a great desire in Mexico that a use should be found for it. I secured a quantity of this cotton and had it examined by an expert cotton manufacturer, who reported that the hairs were

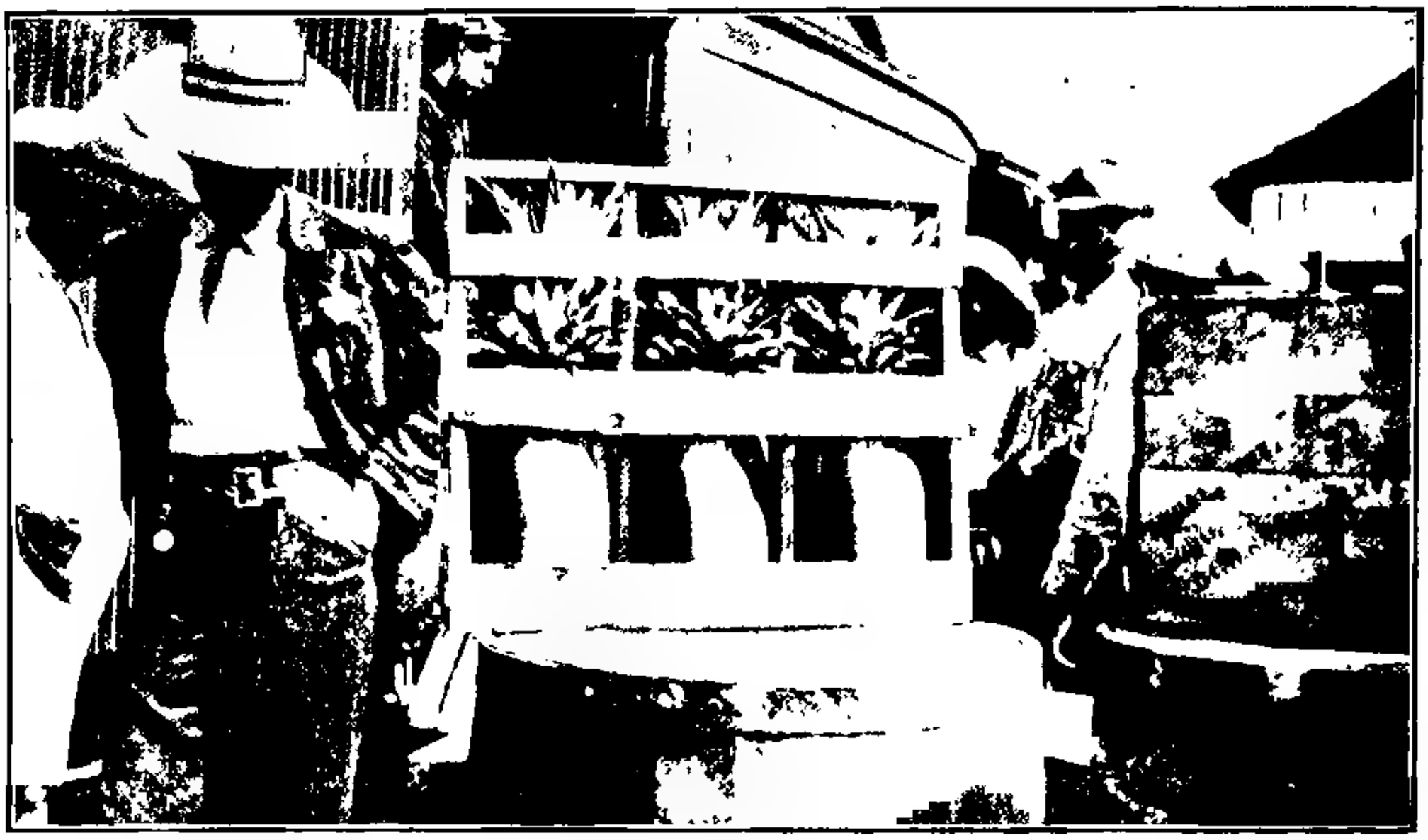

FIG. 6. Pineapples Protected in Hollowed Stems of Banana, Oaxaca, Mexico.

too short. He stated that if, by cultivation and breeding, it could be made to produce a fiber of sufficient length, it would be a valuable product.

H. H. RUSBY.

CONFERENCE NOTES.

The regular conference meeting was held in the library on the afternoon of December 7, and was presided over by Dr. N. L. Britton.

Mr. C. S. Schwarze gave a review of his work on *Dimerosporium*, a genus of the "sooty moulds." The "sooty moulds," which are related to the powdery mildews, differ mainly in that they produce a superficial black (instead of white) mycelial growth which spreads over the substratum. The genus is largely tropical and the species may be either parasitic or saprophytic on the leaves and stems of various plants. Mr. Schwarze mentioned especially the characters which distinguish

this genus from other genera of the same family of plants. A large number of original drawings illustrating the characters of the various species were shown.

Mr. R. C. Benedict showed specimens of teazels which had recently been added to the economic collections. The teazel as a cultivated crop in America is one about which very little is known. The cultivated teazel (*Dipsacus fullonum*), differs from the common wild teazel in having the bracts of the inflorescence recurved and very stiff, forming hooks which are used in "fulling," "knapping" or "gigging" cloths on which such a surface is desired as is seen in serges, etc., as distinguished from worsteds, which are smooth.

Most of the world's supply of teazels is grown in Europe. The best quality of teazels, however, are grown in central New York, in the townships of Skaneateles and Marcellus of Onondaga County. Something about the soil makes the quality of these teazels especially good but efforts to introduce the culture into neighboring regions have been unsuccessful. There are, however, a few grown in Clackamas County, Oregon, by a former Skaneateles man.

Mr. Benedict also called attention to an unusual oak in the eastern part of the Garden, the identity of which is in doubt because of the fact that it resembles two of our common species. Its leaves are cut much like those of the common white oak but its acorns are borne on long stalks as in the swamp white oak. It seems to fruit sparingly, at least it has for the last two seasons, and as a result it has been impossible to secure acorns for culture. These were desired in order to determine whether the seedlings would throw any light on the identity of the parent tree. Such an experiment carried on with the seeds of another suspected hybrid proved conclusively the justice of the suspicion.

Mr. E. W. Humphreys called attention to the fact that among the fossil plants that make up one of the small museum collections from the Triassic of Sonora, Mexico, is a specimen of more than ordinary interest. It is an equisetum (*Schizoneura Carrerei* Zeiller) which does not seem to have been reported from North America before. The specimens described by Zeiller

were from the French possessions in southeastern Asia. Thus, during Triassic times, Sonora, Mexico, and Tonkin, Asia, appear to have had an equisetum in common.

Mr. Nash exhibited a number of flowers of a lady-slipper, *Paphiopedilum insigne*, a native of the Himalayan region, showing a great range of color variation. A great many varieties have received names. In the type of the species, the dorsal sepal, or standard, is green with numerous small brown spots and a white border at the apex, varying greatly in the number and size of the spots and the amount of white on the margin. In the variety *Sanderae*, which was discovered in a consignment of the plants received by Sander & Sons, the standard is a bright yellow-green, the upper portion a pure white, and the only remains of the spotting are a few minute specks at the base. The whole effect is of a yellowish-green flower. The flowers of *Paphiopedilum Massaianum* were also exhibited. This is a hybrid of *P. Rothschildianum* with *P. superciliare*, the latter itself of hybrid production.

Dr. W. A. Murrill exhibited specimens of "Shiitake," an edible mushroom cultivated for centuries in Japan on decaying trunks of oak and hornbeam sprinkled at intervals with rice water, which species has been found to have several scientific names. Specimens obtained from shops in Japan by the Challenger Expedition in 1875 were named *Agaricus* (*Armillaria*) *edodes* by Berkeley (Jour. Linn. Soc. Bot. **16**: 50. 1878), this being the first name applied and the best classification of the species. Excellent specimens have been sent to the Garden by Professor Kusano, of Tokyo, during the past year, and others have been bought in the Chinese shops of New York City.

Dr. N. L. Britton called attention to a Cuban palm (*Thrinax*) possessing a soft fiber which is removed by the natives and used for stuffing pillows and for other similar purposes. Specimens of the plant were exhibited.

FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Professor E. O. Wooton, of the Agricultural College of New Mexico, spent several days at the Garden during December consulting the herbarium. Professor Wooton is spending his sabbatical year at the United States National Museum to complete a work on the flora of New Mexico.

In conservatory range No. 1, house No. 11, is the collection of bananas and related plants. Two plants of the edible species, *Musa sapientum*, are now making fruit; the so-called "hand" of bananas is developed from the cluster of flowers under each of the large colored bracts clothing the axis of the young banana bunch; bananas are natives of the old world tropics; many edible kinds are extensively cultivated throughout tropical and warm-temperate regions. In the same house is *Strelitzia Nicolai*, native of southern Africa, now in bloom, its flowers borne near the top of the tall stem; also *Ravenala madagascariensis*, native of Madagascar, the special interest of which lies in its large leaves with broad sheathing bases, where water accumulates; when these are cut the water runs out in considerable quantity, hence its name of "travelers' tree"; its stems are used for making houses, floors and for other economic purposes.

Volume 3, part 1, of "North American Flora," comprising 88 pages of text, appeared December 29, 1910. It contains the order Hypocreales, with the families Nectriaceae and Hypocreaceae, by Fred J. Seaver; and the Fimetariales, with the Chaetomiaceae, by Helen L. Palliser, and the Fimetariaceae (Sordariaceae), by David Griffiths and Fred J. Seaver. Some of the species here treated, especially those belonging to the genus *Nectria*, are injurious to cultivated plants, while many of the species of *Cordyceps* live upon, and aid in destroying injurious insects.

Many of the orchids in house No. 15, conservatory range No. 1, are now in flower. Among these are the Dendrobiums, from the old world, many of them rich in color, others pure white. A Philippine orchid, *Platyclinis glumacea*, is at its prime, a mass

of slender drooping racemes of small white flowers. *Cattleya* and the closely related genus *Laelia* are attractive. *Laelia anceps*, from Mexico, bears its flowers in clusters at the end of a long stem; the variety *rosea*, with deep rose perianth, is especially showy. *Laelia superbiens*, from Guatemala, a much rarer plant, is also in bloom. *Spathoglottis aureo-Vieillardii*, a hybrid, is remarkable for its long flowering period, lasting usually for two or three months. There is a large display of the greenhouse lady-slippers or Venus'-slippers, *Paphiopedilum* and *Phragmipedium*. *Paphiopedilum Rothschildianum*, from New Guinea, is striking in its striping of yellowish and black. *Paphiopedilum tonso-Charlesworthii*, a hybrid, is of more modest coloring. One of the best of these now in bloom is *Paphiopedilum Alcides*, a hybrid. The flowers are unusually large; the standard is yellowish-green, with a white band at the apex and spotted with purple-black; the petals are green, beautifully marked with rose at the apex. This plant came with the Oakes Ames' collection.

Meteorology for December.—The total precipitation for the month was 2.46 inches. Maximum temperatures were recorded of 41° on the 8th, 45° on the 15th, 43° on the 24th, and 52° on the 30th. Also minimum temperatures were recorded of 9° on the 10th, 7° on the 17th, 12° on the 22d, and 12° on the 31st.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

3 specimens of *Philonotis* from Connecticut. (By exchange with Dr. George E. Nichols.)

150 specimens "Phycotheca Boreali-Americana, "fascicles XXII.–XXIV. (Distributed by Messrs. Collins, Holden and Setchell.)

5 specimens of *Exoascus* from California. (Given by Mr. James McMurphy.)

300 specimens of fleshy fungi from Europe. (Collected by Dr. W. A. Murrill.)

8 specimens of fungi from North Carolina. (By exchange with the United States National Museum.)

200 specimens of lichens from Canada. (Distributed by Professor John Macoun.)

50 specimens of mosses from Canada. (Distributed by Professor John Macoun.)

914 specimens of fungi from Colorado. (Collected by Mr. Fred J. Seaver and Elsworth Bethel.)

2 specimens of *Philonotis*. (By exchange with Mr. Gabriel Diomier.)

2 specimens of *Fragaria* and *Alsine* from Indiana. (By exchange with Mr. Charles C. Deam.)

207 miscellaneous specimens. (By exchange with the United States National Herbarium.)

539 specimens of flowering plants from Manchuria. (By exchange with Imperial Botanic Garden, St. Petersburg, Russia.)

52 museum specimens of Mexican food-plants. (Collected by Dr. H. H. Rusby.)

1 specimen of Japanese wax. (Given by Dr. H. H. Rusby.)

9 museum specimens from Cuba. (Collected by Dr. J. A. Shafer.)

11 specimens of raisin grapes from California. (Given by Mr. G. W. Hosford.)

839 specimens of flowering plants and ferns from Mexico. (Collected by Dr. H. H. Rusby.)

120 specimens of *Crataegus* from Pennsylvania. (Given by Mr. B. E. Smith.)

160 specimens of ferns from Hawaii. (Given by Mr. D. D. Baldwin.)

1 specimen of *Phoradendron macrophyllum* from New Mexico. (Given by J. M. Thorburn & Co.)

1 specimen of elderberry wine made by Mrs. John Marlowe. (Given by Miss Anne Dorrance.)

26 museum specimens from Cuba. ,(Collected by Dr. N. L. Britton.)

2 specimens of flowering plants from the West Indies. (By exchange with Professor I. Urban.)

5 specimens of *Gerardia* from the eastern United States. (Given by Mr. F. W. Pennell.)

2 specimens of *Grindelia squarrosa.* (Given by Mr. F. T. Pember.)

43 miscellaneous specimens. (By exchange with the United States National Museum.)

6 specimens of rice from Burma. (Given by Mrs. Alice C. Russell.)

17 specimens of drugs. (Given by Dr. H. H. Rusby.)

2 specimens of *Sphagnum* from Mt. Marcy, New York. (Given by Professor E. B. Chamberlain.)

2 specimens of mosses from Illinois. (By exchange with Mr. W. W. Calkins.)

9 specimens of mosses from Oregon. (By exchange with the United States National Museum.)

1 specimen of *Solanum Blodgettii* from Florida. (By exchange with the Biltmore herbarium.)

2 specimens of *Gymnogramme schizophylla* from Jamaica. (Given by Professor D. S. Johnson.)

21 specimens of *Fissideus* from South America. (By exchange with Dr. V. T. Brotherus.)

1 specimen of *Oncidium* from Brazil. (Given by Mr. A. Lange.)

3 specimens of Colorado plants. (Given by Mrs. M. E. Soth.)

5 specimens of Colorado plants. (Given by Professor T. D. A. Cockerell.)

2 specimens of *Opuntia* from Louisiana. (By exchange with the United States National Museum.)

33 specimens from Colorado. (By exchange with Mr. George E. Osterhout.)

189 specimens from Colorado. (By exchange with Mr. Earl L. Johnston.)

59 specimens from Nevada. (By exchange with the University of Nevada.)

PLANTS AND SEEDS.

2 *Phyllocactus.* (Given by Mrs. F. E. Curtiss.)

1 *Strelitzia reginae.* (Given by Mr. F. R. Newbold.)

1 *Crassula portulacea.* (Given by Miss Helen I. Spivey.)
1 pineapple plant. (Given by E. A. & W. R. Anderson.)
3 plants for conservatories. (By exchange with E. G. Benson.)
140 plants for aquatic garden. (Purchased.)
8 packets seed of *Eulophus californicus.* (Given by Mr. R. J. Smith.)
1 packet seed *Trapa natans.* (Given by Mr. Emilio Vasconi.)

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(Continued.)

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REPORT ON RECENT COLLECTIONS IN MEXICO.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: I have the honor of submitting the following report of some collecting which I succeeded in doing at odd times during June, July, and August last, while occupied in Mexico by the Consolidated Palo Amarillo Rubber Company.

During the latter part of June, I spent a few days in the mountains at Empalme de Gonzales, Guanajuato, and collected herbarium specimens of about 60 species. The most interesting feature of this flora is a great variety of species of *Opuntia*, some of them very large indeed. The edible fruit of *Myrtillocactus*, which is very abundant here, is an important commercial product. There is here also a very extensive growth of *Euphorbiodendron fulvum*, and the hills are covered with a great variety of species of *Terebinthus*. From this point I sent home a number of living cactuses, as well as a number of museum specimens of fresh fruits. Here also I collected fruiting specimens of the little-known *Mocinna heterophylla*.

A single day was spent in collecting in the mountains between Mexico City and Toluca and herbarium specimens of about fifty species were obtained. Museum specimens of edible fungi were here obtained, two species not having been previously recorded as edible.

Three days were spent in the Limon Mountain region near Balsas, Guerrero, where herbarium specimens of about fifty species were collected, as well as an interesting lot of native edible fruits, in jars, for our museum.

One of the largest collections was made in a single day, and in the rain, on the lava beds between Mexico City and Cuernavaca. This was the favorite collecting ground of Mr. Pringle, and I was very desirous of getting pictures to illustrate its flora. Although nearly five dozen negatives were exposed, not more than a dozen pictures turned out well, owing to the rain and very cloudy condition. The most interesting feature of this place are the wonderful variety and abundance of ferns, the great abundance and variety of dahlias and the scarlet Scrophulariaceae. Some very interesting large Umbelliferae and Araliaceae were observed.

By far the most interesting flora seen was that of the high mountains and deep valleys in the vicinity of Cuicatlan, Almoloyas and Dominguillo in the state of Oaxaca, where several days were spent and large collections made. The flora here is so very varied that it is difficult to name specially interesting groups, with the exception of the Cactaceae. The plains and lower hills are covered with a perfect forest of huge cactuses, of which living specimens were sent home. Museum specimens of the edible fruits of these cactuses were also obtained. Altogether, nearly if not quite a hundred species were here collected. The flora of this section is one of the most interesting that I have ever encountered and is very rich indeed and I cherish the hope of sometime being able to collect extensively there.

A large number of photographs, representing interesting plants, floral features and economic material were obtained. These number more than one hundred. Many lantern slides have been made from them and others will be available for the same purpose.

An account of many of the useful plants observed was presented at the Garden lecture of Saturday, November 12, and a synopsis published in the JOURNAL for January.

Respectfully submitted,

H. H. RUSBY,

Curator of the Economic Collections.

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CONFERENCE NOTES.

At the regular conference meeting held in the library on January 4, Mr. B. O. Dodge, of Columbia University, gave a review of his recent work on the Ascobolaceae, a family of cup-fungi. The family includes ten genera and about two hundred species in the whole world. The cup-fungi belong to the ascomycetes (sac-fungi) and are characterized by having their spores borne in sacs in the ratio: 2–4–8–16–32–64, etc., 8 being the most common number. One of the chief characters of the family Ascobolaceae is that the spore-sacs protrude far beyond the fruiting surface, giving rise to the old idea that the spore-sacs themselves were thrown out at maturity. It has, however, been shown that this is not the case, but the spores are thrown out from the sacs in the same way that shot are fired from a gun and the empty sacs retract and disappear. The genera of the family are much better defined that those of some other families of cup-fungi. Several of the genera possess spores which assume at maturity the most beautiful violet and purple colors finally becoming brown with age. In addition to the color the spores in many of the species of the typical genus (*Ascobolus*) are sculptured in various ways, the sculpturing taking the form of a network, of longitudinal striations or simple tubercular roughenings.

Many of the plants of this group are so minute that they are studied with difficulty and for this reason the state lists of the species of this family are usually small. Nineteen were reported by Mr. Seaver from Iowa in his recent paper on Iowa Discomycetes, this being the largest state list seen.

The most of the species of the family are known as coprophilous (occurring on the dung of animals) fungi, but a few occur on other substrata, one occurring commonly on burnt ground, one on clay soil, one on old sacking and coarse building paper when kept moist, and one species has been recently collected in Colorado on the weathered surface of old wood.

It is claimed that the spores of many of the species must pass through the alimentary canal of the animal body before they will germinate and grow. Many experiments have been conducted in order to simulate the stimuli which the spores would thus receive, which experiments have been claimed to be more or less successful.

This group of fungi is also of interest to morphologists since some of the species show sexual reproduction. Mr. Dodge, in addition to his work on the monograph of this group of plants, has also worked out some very interesting data with reference to the morphology and the stimuli necessary to the germination of the spores which will be published at some later time.

Dr. W. A. Murrill introduced the subject of the gill-fungi of tropical America to which he has been devoting considerable attention, and briefly described a recent trip to Europe made for the purpose of examining type material, an account of which will appear in the JOURNAL for March. The first of a series of articles upon these fungi was published in the January number of MYCOLOGIA, the article being based upon original studies of fresh specimens in Cuba, Jamaica, and Mexico, supplemented by large collections obtained in many parts of tropical America by Britton, Earle, Underwood, Shafer, Wilson, Brace, M. E. Peck, Small, Harris, C. L. Smith, Broadway, Williams, Howe, Duss, Wright, Mrs. Britton, Mrs. Earle, Miss Marble and others.

FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. J. K. Small, head curator of the museums, left recently for a collecting trip in southern Florida.

Dr. B. F. Lutman, of the Vermont Agricultural Experiment Station, visited the Garden on January 3.

Dr. Ezra Brainerd, of Middlebury, Vermont, spent two days at the Garden in February, in continuation of his work on violets.

Dr. and Mrs. N. L. Britton sailed February 18 for Cuba, where they will spend several weeks in a continuation of their botanical explorations in the West Indies.

At the annual meeting of the Connecticut Botanical Club held in New Haven, January 28, Mr. Norman Taylor delivered a lecture on "Some Distribution Factors in our Local Flora."

Dr. W. C. Coker, professor of botany in the State University of North Carolina, recently spent several days at the Garden, continuing his work in the flora of North Carolina.

Mr. W. W. Eggleston, of the U. S. Department of Agriculture, research scholar at the Garden during the past month, recently spent several days consulting types in the Gray herbarium.

Miss Mary P. Anderson has resumed her studies at the Garden on the "Distribution of Ferns in Japan," after an absence of several months.

Dr. Marie Stopes, formerly lecturer in fossil botany at Manchester University, England, spent a week at the Garden in February consulting the library and collections of fossil plants with special reference to the plants of the Cretaceous Period.

Dr. C. F. Millspaugh, curator of the department of botany in the Field Museum, Chicago, spent a few days at the Garden in February on his way to the West Indies where he will continue his explorations on the flora of the Bahamas.

Meteorology for January.—The total precipitation recorded for the month was 1.72 inches. Maximum temperatures were recorded of 51° on the 2d, 53° on the 3d, 47° on the 10th, 46° on the 21st, and 52° on the 27th. Also minimum temperatures were recorded of 11° on the 5th and 18th, 16° on the 24th, and 17° on the 31st.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

200 specimens "Fungi Columbiani." (Distributed by Mr. Elam Bartholomew.)

4 specimens of *Gerardia Holmiana* and *G. decemloba* from the District of Columbia. (Given by Mr. F. W. Pennell.)

1 museum specimen of *Blighia sapida* from Hope Gardens, Jamaica. (Given by Mrs. William Harris.)

2 specimens of mosses from Connecticut. (By exchange with Dr. George E. Nichols.)

1 cone of *Ceratozamia Miqueliana* from the conservatories of the New York Botanical Garden.

1 specimen of *Eleocharis flaccida* from Virginia. (Given by Mr. F. W. Pennell.)

3 specimens of Mexican plants. (By exchange with the United States National Museum.)

1 specimen of a hepatic. (By exchange with Mr. Gabriel Dismier.)

25 specimens of "Lichenes Suecici Exsiccati," fascicle VIII. (Distributed by Dr. G. O. A. Malme.)

2 specimens of *Hygrohypnum* from Salisbury, Connecticut. (By exchange with Dr. George E. Nichols.)

9 specimens of mosses from California. (By exchange with Mr. C. C. Kingman.)

151 specimens from the vicinity of New York City. (Given by Mr. K. K. Mackenzie.)

1 specimen of *Ceratozamia mexicana* from the conservatories of the New York Botanical Garden.

50 specimens "Uredineen," fascicle 47. (Distributed by Professors H. & P. Sydow.)

15 specimens of mosses, hepatics, lichens and fungi. (Given by Miss Caroline C. Haynes)

5 specimens of *Philonotis* from North America. (By exchange with Prof. J. Franklin Collins.)

14 specimens of hepatics from Kyoto, Japan. (Given by Professor Bashford Dean.)

1 specimen of *Barbula Dieckii* from Washington. (By exchange with Dr. Julius Roell.)

36 specimens "Ascomycetes," fascicle 47. (Distributed by Dr. Heinrich Rehm.)

58 specimens from Nevada. (By exchange with the University of Nevada.)

102 specimens of oaks from New Mexico. (By exchange with the Agricultural and Mechanical College of New Mexico.)

128 specimens from Kodiak, Alaska. (Given by Miss Ruth Mylroie.)

122 specimens from Ellesmere Land. (By exchange with the University of Christiania.)

PLANTS AND SEEDS.

4 orchids for conservatories. (By exchange with Mr. J. A. Manda.)

1 plant of *Paphiopedilum Mangoldi.* (Given by Miss H. M. Gould.)

6 plants of *Opuntia.* (By exchange with the U. S. National Museum, through Dr. J. N. Rose.)

3 plants for conservatories. (Given by Mr. Walter Granger.)

3 plants of grape fruit. (Given by Mr. Louis A. Berte.)

1 plant of *Livistona chinensis*. (Given by Mrs. Joseph Pulitzer.)

3 plants of *Agave Wercklei*. (By exchange with the Bureau of Plant Industry.)

7 plants of *Vaccinium*. (By exchange with Bureau of Plant Industry.)

11 plants derived from seeds from various sources.

1 packet seed of *Sequoia gigantea*. (By exchange with the Bureau of Forest Service.)

16 packets of water lily seeds. (Purchased.)

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(*Continued.*)

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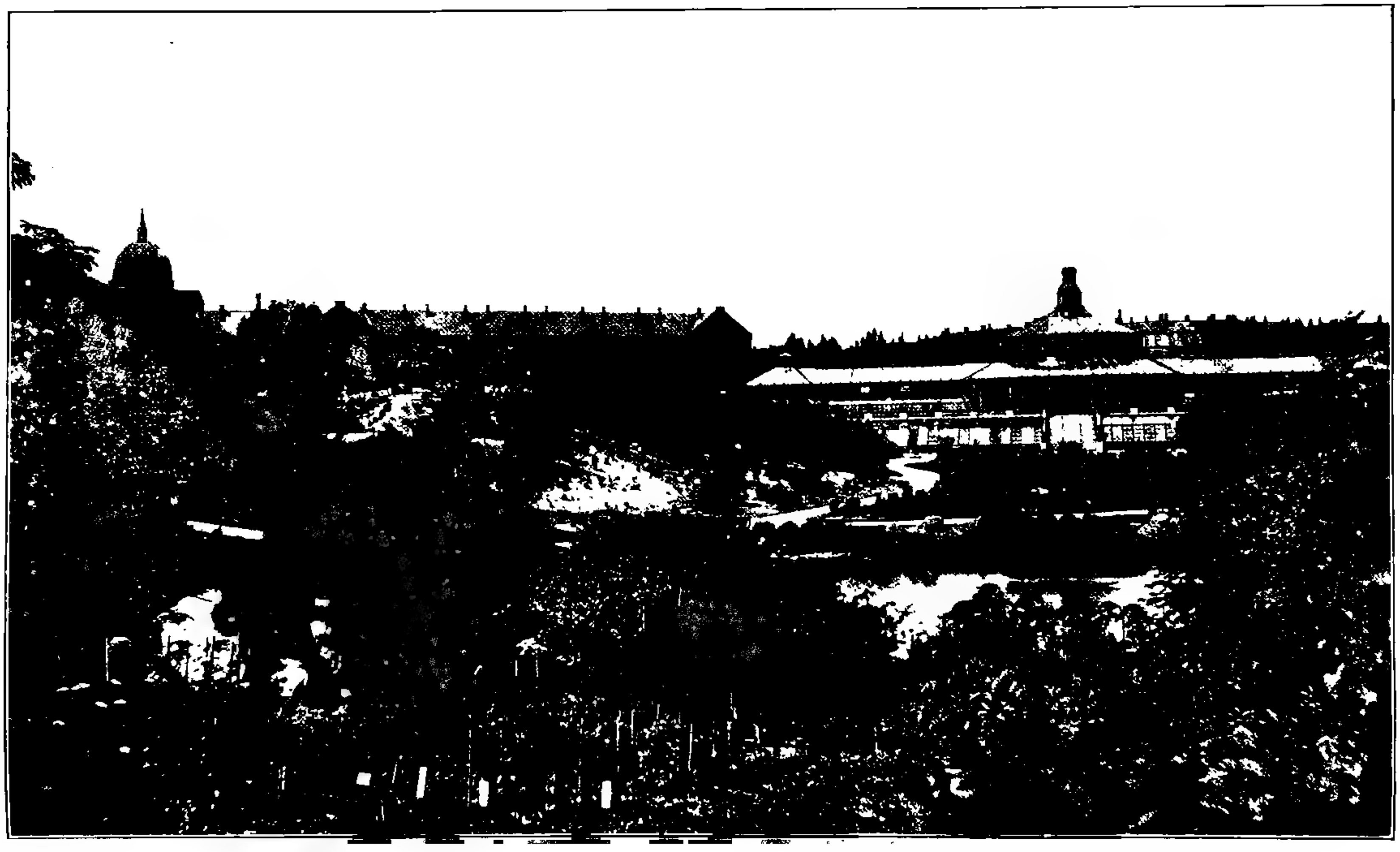

JOURNAL

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STUDYING TROPICAL AMERICAN FUNGI IN EUROPEAN HERBARIA.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: Acting under your instructions, I sailed from New York October 1 on the S.S. "Kaiserin Augusta Victoria," of the Hamburg-American Line, arriving in Hamburg October 10 and leaving the same day by rail for Copenhagen, Denmark, where I made the first stop for the purpose of comparing recently collected gill-fungi with older specimens collected in tropical America. By careful identification in this way, with descriptions and field notes at hand, it is possible to build up a new collection of much greater value both for representation and comparison than the types themselves.

At Copenhagen, I examined the thirty or more drawings of tropical American gill-fungi made by Oersted, copies of which were sent by him to Fries and used in describing many of his species. Very few specimens representing these species were found, either at Copenhagen or elsewhere. Professor Warming and Dr. Ostenfeld gave me a hearty welcome, and introduced Messrs. Ferdinand and Winge, two of their younger botanists. An excursion was made through the very compact and well arranged botanical garden, after which I took the small steamer to Malmö, where I caught the night express to Stockholm and reached Upsala, my next objective point, late in the afternoon of October 12.

Passing through Sweden at this season, one is impressed with its similarity to parts of the Adirondacks. The hills are rugged and crowned with Norway spruce and Scotch pine, against which

the delicate outline of the white birch, clothed in golden-yellow foliage, stands out in pleasing contrast. Lakes and streams abound, bordered with thickets of alder and willow, and the narrow strips of meadow that separate them from the foothills constitute in many places the only arable land. The common heather, *Calluna vulgaris*, and the orange hawkweed, *Hieracium aurantiacum*, were in flower; the second crop of hay was just being harvested; the nights were frosty, and many of the trees had shed their leaves.

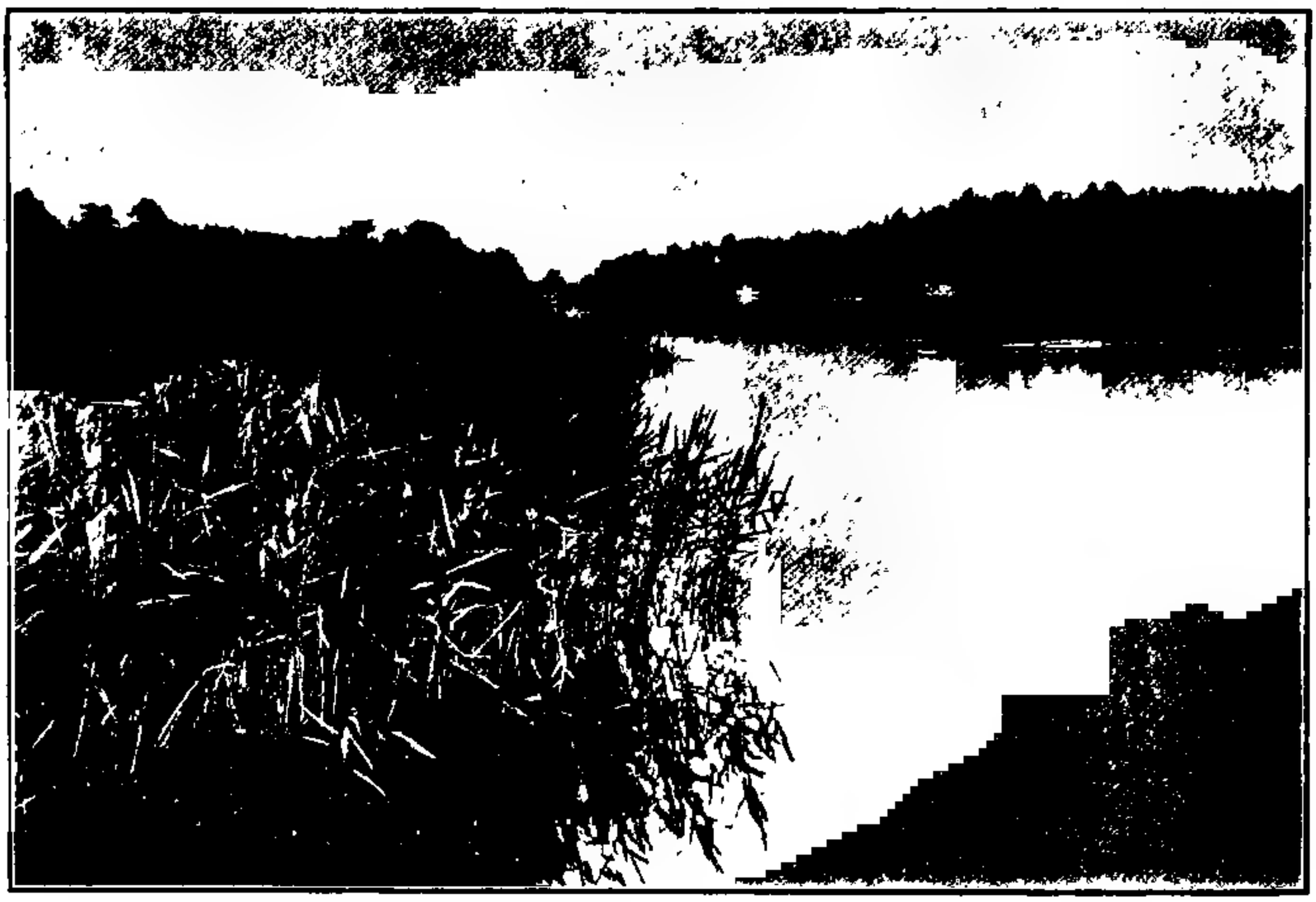

FIG. 7. A small lake near Upsala, Sweden.

Two days were spent at Upsala, during which time, through the kindness of Dr. O. Juel, all of the specimens in the Friés Herbarium which could have any bearing on my study of tropical gill-fungi were examined. Unfortunately, many original specimens in this collection were lost or destroyed by insects thirty or more years ago, before the herbarium was arranged in its present shape. It must be remembered, also, that Fries was in no sense a collector or herbarium maker, and there are several places in Europe where his species are better represented than at Upsala. Most of his original descriptions were drawn from

fresh specimens growing near his home at Femsjö, in southern Sweden, where the flora is quite different from that at Upsala.

On the evening of October 14, I left Upsala and went to Stockholm, visiting Mr. Lars Romell the same evening and arranging for the work of the next day, he having very kindly offered to assist me in every way possible during my stay there. Early the next morning, we visited the Botanical Garden, at Frescati,

FIG. 8. Clusters of the glistening ink-cap mushroom, *Coprinus micaceus*, at the base of an elm near the main building of the University of Upsala.

a suburb of Stockholm, where it was reëstablished by Bergius about twenty-five years ago. The garden is small but very attractively located, and the collection of herbs and shrubs is well worth seeing. A very interesting feature of the museum is the immense collection of woodcuts, lithographs, and photographs of botanists from all over the world, collected by Professor Wittrock, the director, during a period of about forty years.

Returning from Frescati to Stockholm, we examined all the herbarium material we could find on the subject of tropical gill-fungi, the most important being that collected by the Regnell Expedition in South America and worked over by Romell. At the museum we found Robert E. Fries, a grandson of Elias Fries, working on his collections of flowering plants recently made in South America. We also called at the high school to see Professor Lagerheim, who made an extensive collection of various

FIG. 9. Forest of Norway spruce near Hammarby, Sweden, the home of Linnaeus, with young self-sown spruce trees in the foreground.

groups of plants in the equatorial region of South America, the larger fungi of which collection, mostly woody forms, were sent to Dr. Patouillard for determination.

The afternoon was spent in a section of woodland a few miles south of Stockholm, where we obtained a very good representative collection of the larger fungi appearing at that season of the year. These were described next day on the way to Berlin, where I arrived early on the morning of October 17, and pro-

ceeded at once to the botanical garden, located at Dahlem just south of the city.

Through the kindness of Professor Urban, assistant director, and Dr. Lindau, curator of the mycological collections, I was able to examine the large number of tropical gill-fungi in the herbarium of the Berlin Botanical Garden, consisting of Wright's Cuban Fungi from the Winter Herbarium, the Duss duplicates from Guadeloupe, and important collections from South America,

FIG. 10. Portrait of Elizabeth Moraeus, wife of Linnaeus, at the Hammarby house. The celebrated botanist owed much of his success to the inspiration, encouragement, and assistance of his beautiful and intelligent wife.

Africa, and elsewhere. This work required four days, but the time was well spent, especially because of the extensive knowledge gained of African and oriental tropical species.

The plantations in the Berlin Botanical Garden have developed greatly since I last saw them in 1906, particularly those representing the geographical distribution of plants and the dwarfed

vegetation of elevated mountain ranges. Unfortunately, the soil is dry and sandy, and the plantations are entirely exposed to the winds. The large greenhouses are filled with interesting tender plants, many of them very old and of historic importance.

On the evening of October 19, I was entertained at the home of Dr. Paul Magnus, professor of botany at the University of Berlin, where there are this year 12,000 students. Dr. Magnus is

FIG. 11. The common polypody fern, *Polypodium vulgare*, covering the face of a rocky cliff near Norrköping, Sweden.

just completing a large supplement to his work on the fungi of the Tyrol. He is the author of several hundred articles on fungi, especially the plant rusts, and still finds time in his busy university life to add many more to the list each year.

On the evening of October 20, I left Berlin for Paris, fortunately escaping the great railway strike, and was established at the Continental Hotel, within easy reach of the Jardin des Plantes,

by the end of the next day. After leaving Berlin, where chrysanthemums and dahlias were almost the only flowers still in bloom and where the street-trees were mostly bare, the vegetation became gradually greener, with less autumnal coloration, and the evidences of frost became very slight.

The beautiful Ardennes Valley, in particular, was almost untouched by the approach of winter. All the way from the French

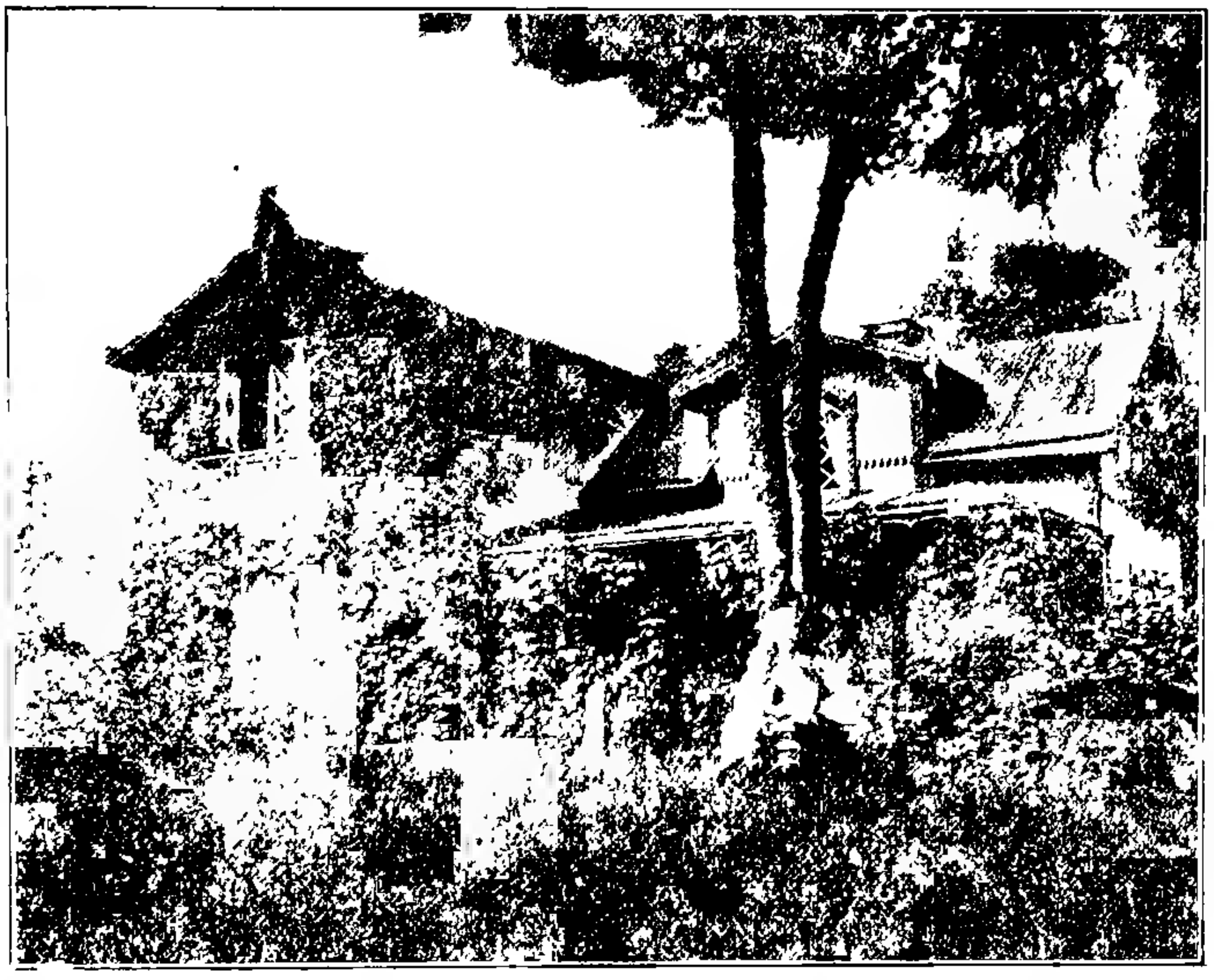

FIG. 12. A Swedish cottage, showing the luxurious growth of vegetation during the short summers in the north. Owing to the abundant moisture present, many species of lichens cover the trunks and twigs of trees, as well as all exposed rocks and timbers.

frontier to Paris, peasants were busy gathering sugar beets, pulling or spading them up, cutting away the leaves, and loading them upon large carts drawn by from two to four horses in tandem. Others were plowing small strips of land for wheat, using heavy plows drawn by large white oxen. Peasant women were gathering pears and apples. The poplar trees planted everywhere along the roads and fence-rows for shade and fire-

wood, showed but slight autumnal coloration and no loss of foliage.

Imagine my surprise, on awaking the following day, to find it the coldest and most disagreeable I had experienced after landing, except one day at Upsala that began with a snow-storm. I nevertheless went early to the Cryptogamic Herba-

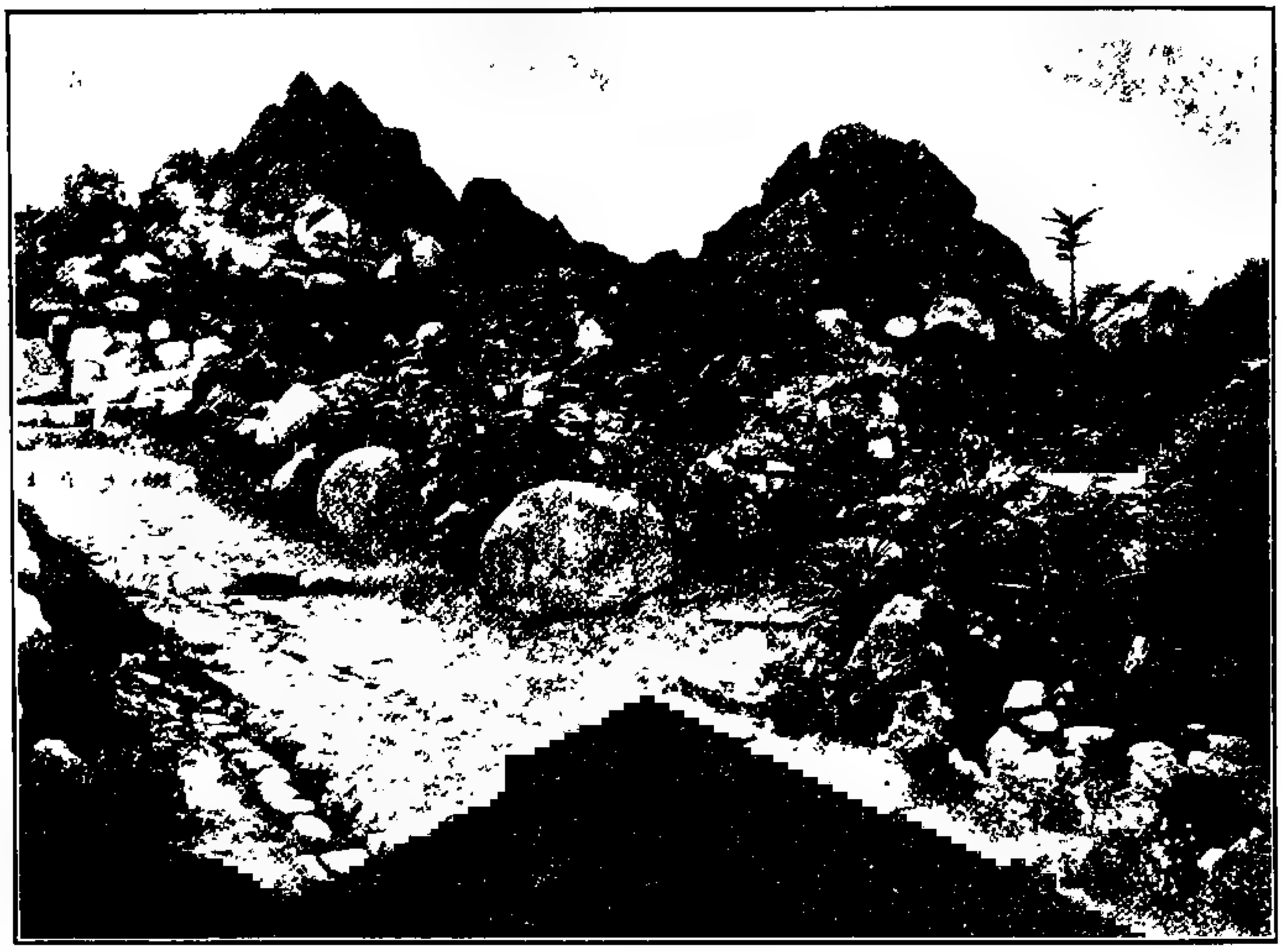

FIG. 13. A portion of the Berlin Botanical Garden devoted to alpine plants. The large masses of rock used in constructing these miniature mountains were actually brought from the mountain systems represented.

rium on the Rue de Buffon, where Dr. P. Hariot awaited me, kindly placing at my disposal the very complete tropical American collection of fungi containing Montagne's Cuban and South American types, as well as many species described by Berkeley & Curtis, Léveillé, Patouillard, and others. For my present purpose, this collection proved to be the most valuable examined, with the exception of the one at Kew.

About four days, from October 22 to October 26, were spent at this herbarium, while, in going back and forth, most of the botanical portion of the Jardin des Plantes was rather carefully

examined. Fortunately, the weather had been mild and most of the flowers of the season were in bloom. I was particularly impressed with the attractive appearance of several oval beds of a golden chrysanthemum called "*Gerbe d' Or*," a very appropriate name. In the enclosure controlled by the *École de Botanique*, labels of different colors, red, green, blue, and yellow, are used to designate plants used for medicine, food, arts, and orna-

FIG. 14. View in the Luxembourg Gardens, Paris, one of the many beautiful public parks of the city.

ment, respectively. Black labels are attached to poisonous plants. The famous specimen of black locust, *Robinia Pseud-acacia*, planted on the grounds by Vespasian Robin in 1656, had a main trunk a yard in diameter, but this has all disappeared above ten feet from the ground, the present top of the tree being composed of several branches that have sprung from this much abbreviated trunk.

On the afternoon of October 26, I began the examination of Dr. Patouillard's private herbarium at Neuilly, a suburb of Paris, in which work Dr. Patouillard gave me valuable aid and many helpful suggestions. Besides other valuable material, this herbarium contains the types of many species described from the comparatively recent collections of Duss in Guadeloupe, which are of the greatest importance in the study of tropical American fungi. I was glad to find that these types are much better

FIG. 15. Famous beech trees in the Royal Gardens at Kew, England.

preserved than most of the Duss specimens seen elsewhere. A collection of drawings of Mexican fungi made by Paul Maury proved to be of unusual interest, but, unfortunately, nearly all of the specimens from which they were made were lost. Dr. Patouillard is one of the great exponents of the extensive use of the microscope in taxonomic study, and his herbarium abounds in drawings, measurements, and other useful results of such study.

During my stay at Neuilly, I made a small collection of gill-fungi in the Bois de Boulogne, which were determined for me by Dr. Patouillard.

On the morning of October 28, I left Paris for London *via* Calais and Dover, arriving about sundown, and taking a suburban train for Kew the same evening. The day was fine and the journey through France and southern England delightful. The cool weather had tinged the poplars along the highways and the young hardwood forests planted on the sterile uplands with bright autumnal tints, while the grass on the meadows and most of the foliage in the lowlands was still green. Intensive farming operations continued as usual for the season. On nearing the coast, stretches of the common heather in flower, and thickets of Scotch broom became very conspicuous, the latter being much used for sweeping. The small twigs of deciduous trees and shrubs are also abundantly used for this purpose in France and elsewhere in Europe.

The Royal Gardens at Kew, in many ways the most attractive public gardens in the world, are situated on the south bank of the Thames, in the suburbs of London. They contain beautiful lawns, lakes, and vistas; curving paths bordered with decorative shrubs; thickets of holly, azalea, and rhododendron; groves of magnificent beeches and evergreens; and towers, palaces, formal gardens, museums, and many glass houses. The two largest houses, the palm house and the temperate house, particularly impress the visitor on account of their splendid perspective, which would be impossible in a climate like that of New York, where interiors must be subdivided for heating purposes.

The mycological herbarium at Kew is very complete, the collection of gill-fungi being twice as large as that of any other institution visited, and especially rich in American species described by Berkeley, Cooke, Massee, and others. There are also arge collections from Ceylon, India, eastern Asia, and many other parts of the world.

During a stay of nearly two weeks at Kew, I collected a number of interesting gill-fungi in the garden grounds, which were kindly determined for me by Professor Massee and Mr.

Cotton. Professor Massee has just completed an introductory work on fungi containing forty colored plates illustrating many species, which is to appear within a few months. A visit to the new home of Professor Hemsley at Strawberry Hill was much enjoyed. I was entertained by Colonel Prain, the director, on November 10. On November 12, I sailed for New York from Liverpool on the S.S. "Carmania," of the Cunard Line, arriving November 20.

The results of this visit to the principal herbaria in Europe were most gratifying. All of the material bearing on the subject in hand was examined and compared with specimens from our own collections, and many valuable notes were secured. A series of articles on the gill-fungi of tropical North America will appear this year in MYCOLOGIA, beginning with the January number.

Respectfully submitted,

W. A. MURRILL,

Assistant Director.

CONFERENCE NOTES.

The regular monthly conference meeting was held in the library on February 1, and was presided over by Dr. W. A. Murrill. At this meeting Dr. E. D. Clark gave a discussion of work recently done on the poisonous properties of the mushroom, *Inocybe infida*.

Although this *Inocybe* is usually considered a harmless mushroom, it recently caused the poisoning of a physician and his family in this vicinity. The physician reported his own symptoms as follows: rapidly developing feeling of fullness of the head and an effect on the heart, likened to the action of nitroglycerin, profuse sweating and finally pain in the abdomen, all of which symptoms soon passed away leaving no prostration. Our attention was drawn to this plant and we undertook a chemical and toxicological investigation of its properties.

The method of Harmsen for the isolation of muscarin from *Amanita muscaria* was applied to the sample of *Inocybe infida*.

Aqueous solutions of the product exhibited toxic actions upon frogs when injected into the lymph-sacs. The following symptoms were elicited. Ten minutes after the injection of a moderate quantity, the frog made swallowing motions, apparently had difficulty in breathing and began to be lethargic. It remained partly paralyzed for ten to twenty-four hours, after which recovery took place in about half the number of cases.

In order to see if the alcohol extraction method of Harmsen was as efficient as its author claimed, we applied it to samples of the deadly *Amanita muscaria* and to the harmless *Clitocybe multiceps*. In the first case, final residues were obtained which were extremely toxic to frogs, killing them with the classical symptoms of muscarin poisoning. On the other hand, the *Clitocybe* residues were wholly non-toxic but gave the general tests for alkaloidal substances.

We now decided to purify all of our mushroom extraction residues by precipitation with potassio-mercuric iodide and subsequent treatment as outlined by Dragendorff. After this purification treatment, aqueous solutions of the final products cause in frogs exactly the same symptoms as similar solutions of the residues from the original alcoholic extracts. At this time it was also noted that all of the purified products gave strong positive reactions for choline with Rosenheim's periodide test. The extracted materials from the harmless *Clitocybe multiceps* showed no toxic action upon frogs under any circumstances but seemed to contain very large amounts of choline.

Our conclusion is that *Inocybe infida*, as well as *Amanita muscaria*, contains material which, although precipitated by the alkaloidal reagents and exerting toxic effects on frogs, differs both quantitatively and qualitatively in its effects from those given by muscarin from *Amanita muscaria*. On the other hand, extracts like those from *Amanita* and *Inocybe*, when obtained from *Clitocybe multiceps*, which is known to be harmless, show no toxic effect on frogs. It also seems likely that choline is present in the alcoholic extracts of the mushrooms and passes unchanged through the treatments planned to extract and purify muscarin and similar substances.

Mr. Fred J. Seaver gave the results of his studies of the cup-fungi collected in Colorado during the past summer. Of the nine hundred specimens collected, approximately one fourth of this number belonged to the cup-fungi. From this number of specimens sixty species have been identified and a number are still undetermined. Two new species are to be described, also eight species have been reduced and other possible reductions suggested. The results of this study will appear more in detail in a paper to be published in MYCOLOGIA.

Dr. P. A. Rydberg gave an account of the recent shipwreck of Professor J. M. Macoun. Leaving Halifax on the 2d of July, he reached Churchill on the 25th and after botanizing for a month in the vicinity started north. Sailing up Hudson Bay in the steamer "Jeannie", the party reached Wager Inlet which is almost in the Arctic Circle and here on the evening of September 5th, the vessel was wrecked in a storm. In order to reach home it became necessary for the party to travel 800 miles overland by snow-shoes. All of their botanical specimens were saved and will prove to be of much interest.

FRED J. SEAVER.

NOTES, NEWS AND COMMENT.

Dr. J. K. Small, head curator of the museums, recently returned home, after a collecting trip of several weeks in southern Florida.

Mr. George V. Nash, head gardener, recently spent several days in Washington studying grasses in connection with his work on North American Flora.

Mr. William Solotaroff, formerly connected with the Garden, and now superintendent of the Shade-tree Commission of East Orange, New Jersey, has just published through Messrs. Wiley & Sons a well written and attractively illustrated book of nearly three hundred pages on "Shade-trees in Towns and Cities," in which every tree lover will be interested.

The government steamer "Albatross" sailed from San Diego, February 25, on a two months' collecting expedition to Lower

California. Dr. C. H. Townsend, of the American Museum of Natural History, is in command of the expedition, and he is accompanied by seven investigators and collectors, representing his own institution, the New York Botanical Garden, the New York Zoological Society, and the United States National Museum. Dr. J. N. Rose, representing the Garden, will devote his attention to the cacti of the peninsula, and he is expected to make large and important additions to the collections of these interesting desert plants now under cultivation in the conservatories here.

In conservatory range 1, house No. 4, is a large plant of *Medinilla magnifica*, belonging to the Melastomaceae or meadow-beauty family. This, a native of the Philippines, bears its flowers in large hanging clusters of pink; these occur in great profusion and make of the plant a charming object when in full bloom. Its first flowers are about to open, and the tree usually remains in bloom four or five weeks. Most of the members of this family have 3-nerved leaves; this *Medinilla* and a few others have the leaves pinnate-veined. The little plant of this region, known as *Rhexia virginica*, or meadow-beauty, belongs to this family.

In the same house, in the central area, is a large plant of the Mexican bread-fruit, *Monstera deliciosa*. This forms a part of the aroid group, in the westerly part of the house. The fruit is cylindric, six to eight inches long. A number of these may be seen at the top of this plant. When ripe the fruit is edible, and resembles the pineapple in odor and flavor. It is also known as cerinam.

Meteorology for February.—The total precipitation for the month was 3.66 inches. Maximum temperatures were recorded of 47° on the 4th, 51° on the 12th, 45° on the 16th, and 57° on the 25th. Also minimum temperatures were recorded of 12° on the 3d, 15° on the 6th, 9° on the 16th and 11.5° on the 22d.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

27 cultures of fungi. (Given by Dr. Mel. T. Cook.)

3 specimens of *Rhinotrichum*. (Given by Professor D. R. Sumstine.)

7 specimens of polypores from Ohio. (By exchange with L. O. Overholts.)

20 specimens of "American Hepaticae." (Given by Miss Caroline Coventry Haynes.)

136 specimens of mosses from Japan. (By exchange with M. Jules Cardot.)

11 specimens of mosses from California. (By exchange with C. C. Kingman.)

283 specimens of mosses from Mexico. (By exchange with M. Jules Cardot.)

8 specimens of *Calymperes* from South America and the West Indies. (By exchange with the Kgl. Bot. Garten, Berlin.)

4 specimens of *Splachnobryum* and *Syrrhopodon*. (By exchange with M. Jules Cardot.)

1 specimen of *Anthelia Juratzkana* from Washington. (Given by Miss Caroline Coventry Haynes.)

4 specimens of Hepaticae from New York and New Jersey. (Given by Miss Caroline Coventry Haynes.)

5 museum specimens of "guayule" (*Parthenium argentatum*) from the Stockton Plateau, Texas. (Given by Prof. F. E. Lloyd.)

28 specimens of seed-plants from the Rocky Mountains. (Given by Mr. W. W. Eggleston.)

PLANTS AND SEEDS.

1 plant of *Crinum* for conservatories. (Given by Mr. James Wood.)

51 plants derived from seeds from various sources.

1 packet seed of *Clitoria glycinoides*. (By exchange with Public Gardens, Jamaica, W. I.)

1 packet seed of "Chinese date." (Given by Dr. H. H. Rusby.)

468 packets of seed. (By exchange with the Missouri Botanical Garden.)

1 packet of seed of *Triplaris surinamensis*. (By exchange with Public Gardens, Jamaica, W. I.)

1 packet of seed of *Juglans rupestris*. (Given by E. F. Ramsey.)

1 packet seed. (Given by Mr. H. C. Pearson.)

1 packet of seed. (By exchange with Imperial Botanic Garden, St. Petersburg, Russia.)

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A LITTLE-KNOWN MANGROVE OF PANAMA.

While searching for marine algae in the mangrove swamps at the Pacific terminus of the Panama Canal (FIG. 16), in December,

FIG. 16. A scene at Balboa, the Pacific terminus of the Panama Canal. The Panama mangrove, *Pelliciera Rhizophorae*, grows in the mangrove thickets on the estuarial mud shown near the center of the photograph and also at the right. The following photographs (Figs. 1–4, 6) were taken at the extreme right. The present photograph was evidently taken at a moderately low tide; it is here reproduced by courtesy of the Pictorial News Co., New York.

1909, I was impressed by curious, large, ovoid, top-shaped, long-beaked, corrugated, brown fruits that were frequent on the mangrove mud at ebb tide. It required scarcely more than the

FIG. 17. The Panama mangrove, *Pelliciera Rhizophorae*, at Balboa, Canal Zone. A well-developed tree about 25 feet high growing on alluvial mud near the high-tide line. This tree has been isolated by clearing operations in the swamp. The red mangrove (*Rhizophora Mangle*) is shown at the left.

lifting of the eyes to discover the source of these strange fruits. The trees that bore them were growing in company with the red mangrove (*Rhizophora Mangle*), the white mangrove (*Lagun-*

cularia racemosa), and a black mangrove (*Avicennia* sp.) between the tide-lines or sometimes at slightly higher levels than the red mangrove. The trees were found in all stages of development from very young seedlings to maturity. They begin to bear flowers and fruit when only two or three feet high (FIG. 20), but

FIG. 18. Stumps of the Panama mangrove, *Pelliciera Rhizophorae*, at Balboa, Canal Zone. The swamp vegetation has been cleared away as a part of the campaign against mosquitoes. The red mangrove (*Rhizophora Mangle*) is shown in the background.

when full grown are about 25 or 30 feet high (FIG. 17), with a single trunk, which is buttressed at the base somewhat after the fashion of the bald cypress (*Taxodium*) of the southern United States (FIGS. 17 and 18). Some of the roots that form these buttresses or a part of them are more isolated and distinct than the buttresses in the bald cypress, which are flutings of the trunk, yet

the tree, so far as would appear from our photographs, can hardly be said to send down aerial roots which develop into prop-like supports after the usual manner of the red mangrove. The basal mass of roots and fluted trunk is more or less solid.

The leaves of this mangrove are simple, unstalked, alternate (2/5 arrangement), oblong-lanceolate, broadest near the middle (sometimes a little below or above the middle), leathery, smooth, polished, dark green, and entire except for small glandular teeth that disappear with age. The only conspicuous veining is the midrib and this is sometimes obscure towards the obtuse apex of the leaf. The leaves are commonly 3–5 inches long and 1–1.75 inches in greatest width.

The flowers of this peculiar tree are large and showy, slightly suggestive of those of certain magnolias, though rather less conspicuous. They are solitary in the axils of the leaves, are white or tinged with pink, and when fully expanded have a spread of four or five inches, the five long narrowly tongue-shaped petals radiating irregularly somewhat after the style of the arms of certain star-fishes. Reference to a photograph (FIG. 22) will give a better idea of the general appearance of the flower than any descriptive words can. It is not the purpose of this paper to give a detailed technical description of the tree and its parts but it may be of interest to state that the flower-bud is enveloped and subtended by two bracts (FIG. 22), which are narrower than the leaves but broader and a little longer than the petals and are rose-colored, coral-red, or crimson. The calyx, corolla, and stamineal whorl each consist of five free and distinct alternating members. The externally crimson sepals are about three fourths of an inch long and are ovate in general outline but are strongly concave (FIG. 21), suggesting the shells of certain limpets; in the middle of the inner surface of each and occupying about one half of its area are numerous small vesicular pores or glands. The petals are usually light pink except for the prominent whitish midrib, though on certain trees, especially the older ones, they are nearly white. They are 2.5 inches long, linear or elongate-tongue-shaped from a somewhat expanded base, which is about 0.6 of an inch wide, and they taper gradually to a blunt point.

When the flower is fully open the petals are somewhat reflexed or recurved, especially towards the apex, and the outer face of the petal becomes concave. The petals fall soon after the opening of the flower and a little later the sepals and bracts drop away. Attempts to prepare herbarium specimens from the trees showed that it was difficult to do so in such a way as not to detach the petals, sepals, and bracts; even the leaves are apt to fall from the branches after being dried by the methods customary with botanical collectors. The floral envelopes are more persistent when material is preserved in water with the aid of formalin, especially if flower-buds or freshly opened flowers are selected for the purpose. I do not recall that I noted any odor from the flowers at the time of collecting or that I observed any insects about them in the field but in attempting to dry specimens for the herbarium a "sweetish" odor was noticed and the flowers and leaves exuded a sticky substance that attracted great numbers of ants. The water in which specimens have been preserved with the aid of formalin has an odor, modified of course by the formaldehyde, that is strongly suggestive of crude West Indian molasses.

The stamens are about 2.5 inches long and their filaments are at first found closely appressed to the much elongated ovary in every other one of the ten pronounced longitudinal grooves on the surface of that organ. The narrow anthers are an inch long or more, are sagittate at the base, and the narrow connective is produced at the apex into a corrugated point, which, before the opening of the flower, projects beyond the stigma. The rigid woody pistil is conic-cylindrical, 2.5 inches long, and is divided about equally as to length between the 10-grooved ovary and the smooth style. The main cavity of the ovary is divided into two compartments, which are, sometimes, at least, confluent above. Each of the compartments has a single ovule, but only one of the two ovules develops into a seed.

The fruits of this peculiar tree are at maturity top-shaped, (FIG. 23), 3–5 inches broad, and 3.5–5 inches long, including the abruptly tapering beak or snout, which comprises from one third to one half its length. When young the fruits are greenish

brown, but later change to a chocolate-brown. They soon develop upon their surface, in more or less definite rows, numerous small waxy-yellow or red pustules which become pulverulent and somewhat elongated and have the general appearance of lenticels. The surface of the fruit shows more or less distinctly

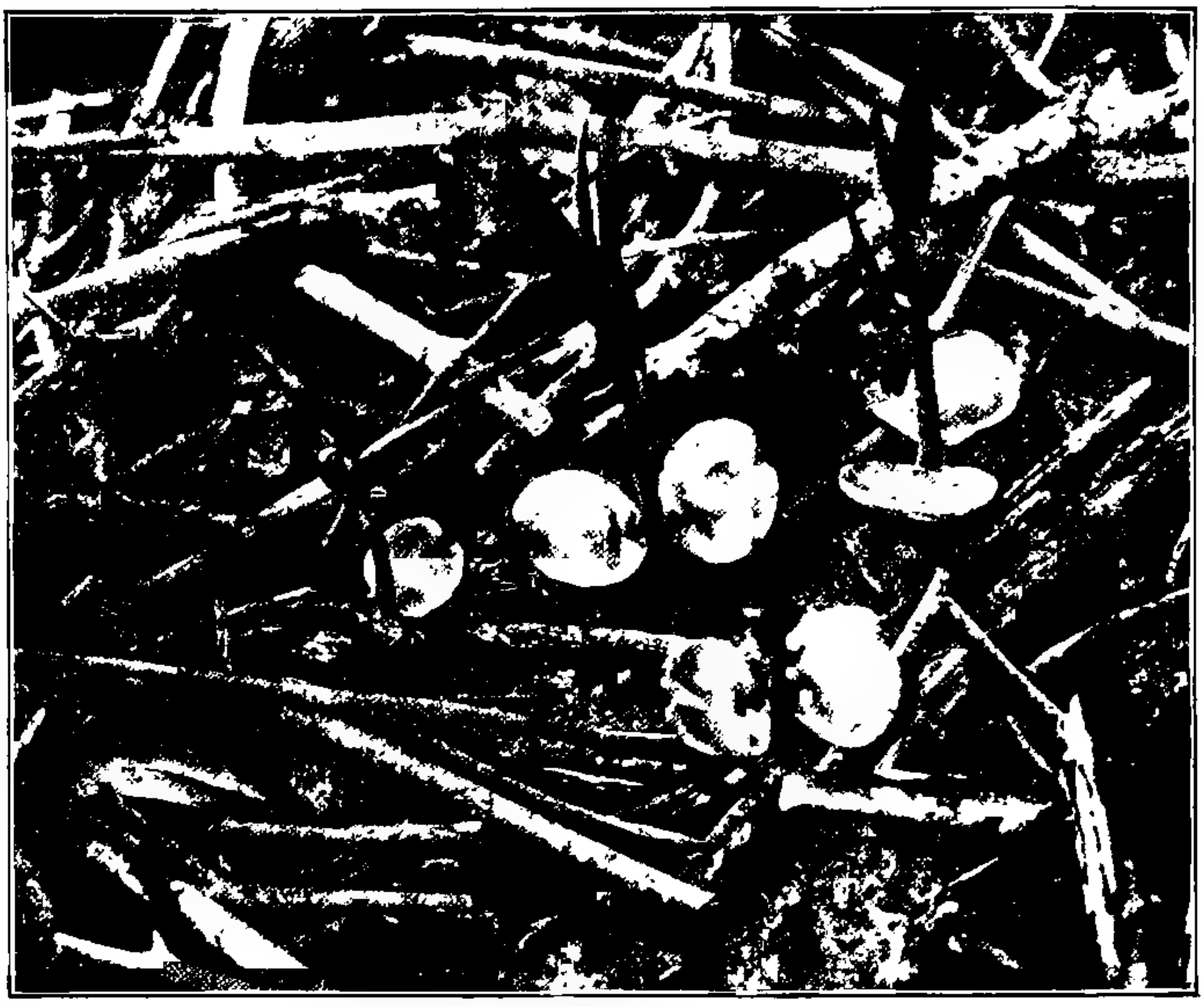

FIG. 19. Seedlings of *Pelliciera Rhizophorae* in alluvial mud near the high-tide line, Balboa, Canal Zone. About one eighth of the natural size.

the ten original longitudinal ridges of the ovary surface, but there are also an equal number, or more, of secondary ridges, so that the surface of the fruit in its final mature state is quite irregularly many-ridged and -grooved (FIG. 23). The wall of the fruit, which is indehiscent, is leathery and averages about one fourth of an inch thick. The single seed consists almost wholly of the large embryo, the seed-coats being scarcely recognizable and endosperm evidently lacking. The embryo is cordate in general contour, with a rigid, pointed hypocotyl or radicle about half an inch long, which projects into the beak of the fruit

(FIG. 23, upper row). Each of the two firm fleshy cotyledons has somewhat the form of a half of a flattened heart bisected in the plane of the flattening; each is 2.5–4 inches in horizontal diameter, 2–3.5 inches in vertical diameter, and is about three quarters of an inch thick in the middle. The crimson or coral-line-red plumule is strongly developed at the time of the dropping of the fruit; its apex is gracefully curved or hooked somewhat

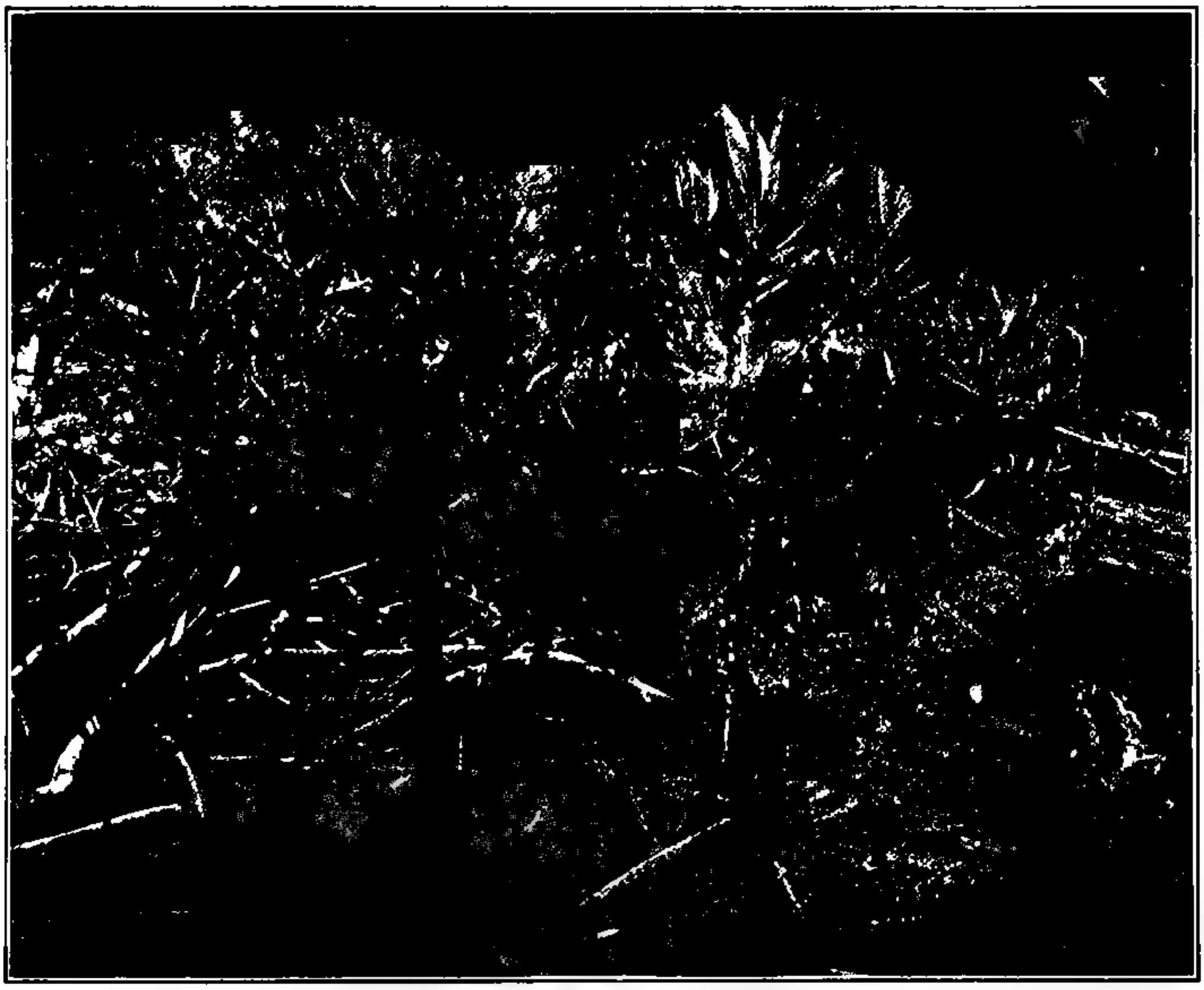

FIG. 20. Young trees of *Pelliciera Rhizophorae*; two or three feet high and beginning to flower.

after the fashion of an interrogation mark; if straightened out the plumule would measure about three inches in length. If this mangrove were not so far removed from most of the schools of the world, its embryo, with its great cotyledons and large gaily colored plumule would doubtless come into great demand as an attractive and instructive object for demonstrations and dissections in botanical classes. The peculiar long-beaked fruit of this mangrove is apparently a biological adaptation to the

conditions under which the tree grows. The substratum on which this mangrove, like the *Rhizophora*, flourishes is commonly a soft estuarial mud into which a prowling collector ordinarily sinks for six or twelve inches or more. The fruit of the tree falls point downward and its weight is such that the force of the

FIG. 21. Flowers and foliage of *Pelliciera Rhizophorae*. About one fourth of the natural size. In the upper flower all of the petals but one have fallen, showing well the concave sepals and the two bracts (here horizontally divaricate). In the lower flower the five petals still persist, though one of them (directed downward in the photograph) is obscure on account of overlying one of the bracts.

fall anchors it in the mud below even though the mud at the time may be covered by a certain amount of water. And here in the mud near the upper range of the tides, planted with its radicle downward, it germinates (FIG. 19).

This strange mangrove was so totally different from those of Bermuda, Florida, and the West Indies, with which I had associated rather intimately for some years, that I secured photo-

graphs of it in various stages of development and also specimens of its foliage, flowers, and fruit, for the Garden museum and herbarium. The tree proved to be unknown to members of the Garden staff to whom specimens and photographs were exhibited, but finally a description of it was located by the Garden's librarian, Dr. John Hendley Barnhart, and located, rather curiously, in the Tea or Camellia Family. That its affinities were not immediately recognized is not especially surprising, as its flowers and fruit are somewhat anomalous in this family,

FIG. 22. Flowers, flower-buds, and foliage of *Pelliciera Rhizophorae*. About one third of the natural size. The branch at the upper right-hand corner shows a flower-bud nearly ready to open; the bud is enclosed by the two bracts; sepals are shown at the base of the bract in the foreground and above the sepal on the left the corolla is exposed; a pistil after the floral envelopes have fallen is seen in the axil of the broad leaf on the left. The branch at the lower left-hand corner shows two axillary flower-buds and the terminal leaf-bud. In the opened flower at the lower right-hand corner, the two bracts, here somewhat twisted and rolled, are well exhibited.

though its leaves seem to agree fairly well with those of other members of the group. The genus, consisting of this single species, is given the rank of a tribe or section in most of the works that have had to deal with it, and it is quite possible that the taxonomists of the future, if modern segregating tendencies continue to prevail, will find sufficient grounds for recognizing this peculiar tree as the type of an independent family. The idea of a member of the Tea or Camellia Family consorting with the red mangroves will at least strike many taxonomists and ecologists as a detail of distribution and adaptation that has not been particularly emphasized in botanical literature.

It appears that this mangrove, which thus far in our discussion has been nameless, was first described by Bentham and Hooker in 1862 under the name "*Pelliciera*, Planch. et Trian. gen. nov." Later in the same year, in the Annales des Sciences Naturelles, Triana and Planchon described it further and added the specific name *Rhizophorae*, presumably in allusion to its association with the red mangrove (*Rhizophora Mangle*). Specimens of the tree were probably first collected by the Colombian botanist, José Triana, about the mouth of a water-course on the Bay of Buenaventura, Province of Choco, in what is now the Republic of Colombia. This locality is on the Pacific coast and is about 400 miles south of the city of Panama, near which city my specimens were obtained. At about the same time that Triana was collecting a specimen of the tree on the shores of the Bay of Buenaventura, or probably a little later, Dr. Sutton Hayes found it growing with mangroves "in the Rio Grande swamps," which is doubtless just where I found it fifty years later, the Rio Grande now forming the Pacific end of the Panama Canal. Triana's scanty specimen, brought by him to France, and the more ample specimens sent by Sutton Hayes to the Royal Botanic Gardens at Kew, England, appear to have formed, essentially, the basis of the published knowledge of this peculiar tree, though the species has since been reported for one locality in Costa Rica by John Donnell Smith. Triana's specimen from southern Colombia and Sutton Hayes's from Panama seem to have agreed except as to the color of the flowers and the number of loculi in the

ovary, which are said to be 5 in the Triana tree and 2 in Sutton Hayes's. On this ground Triana and Planchon proposed to distinguish the Panamanian tree as var. *Benthamii*. But whether the petals and sepals are pink or white is of no significance, judging from what I saw of the flowers in Panama. And

FIG. 23. Fruits and seeds of the Panama mangrove, *Pelliciera Rhizophorae*. About one third of the natural size. The sharp points of the beaks of the nearly mature fruits were broken off in handling, but points still persist in the pair of very immature fruits. In the fruit shown in the upper row a part of the pericarp has been removed, exposing the single seed, which is scarcely more than a large embryo with its radicle or hypocotyl pointing downward and penetrating the beak of the fruit. To the right in the upper row is an embryo with the two large cotyledons partly separated to show the hooked plumule.

the alleged 5-celled ovary of the more southern tree seems to be in need of further investigation, for the original diagnosis by Planchon and Triana was confessedly based on "un exemplaire

très imparfait." The descriptions by Bentham and Hooker and by Triana and Planchon were supplemented in an important manner in 1879 by W. Botting Hemsley, who in his Botany of the Biologia Centrali-Americana published an excellent plate of figures drawn from materials obtained in Panama by Sutton Hayes. It is evident, however, from his description and figure that the fruit that he had was rather small or immature. It is probable that all of the descriptions over-emphasize the *Rhizophora*-like habit of the tree. So far as my recollections and photographs go, *Pelliciera* does not show wholly independent proplike aerial roots after the manner of the red mangrove, but it is to be borne in mind in this connection that the photographs were taken on comparatively high and dry soil and that even *Rhizophora* in its upper ranges has few or no aerial roots serving as props, in striking contrast to its habit when invading the water from a river-bank or when trying to find anchorage on a more or less submerged coral reef.

As a detail of orthography it is to be noted that Triana and Planchon changed Bentham and Hooker's spelling of the generic name *Pelliciera* to *Pelliceria*, even while explaining that the genus was dedicated to the memory of Guillaume Pellicier, bishop of Montpellier, "diplomate, érudit, naturaliste." The original spelling, however, has been generally maintained and would seem to accord better with the spelling of the name of the man whom it was the intent to honor.

If any apology is needed for reproducing so many photographs as accompany these notes, it may be found, I hope, in the fact that, to the best of my knowledge, no photographs of *Pelliciera* have ever before been published and in the further fact that any tree that associates with the geologically important and biologically interesting red mangrove has more than ordinary claims to attention.

MARSHALL A. HOWE.

THE EDUCATIONAL WORK OF BOTANIC GARDENS.*

The botanic garden as an educational institution is a comparatively modern development, and may be traced backward through a series of gradual stages to the time when man first began to cultivate wild plants. The first gardens were cultivated for useful rather than ornamental purposes, and the earliest Greek gardens were little more than olive orchards. The Greeks also developed ornamental flower gardens, and this idea was borrowed from them by the Romans.

The earliest botanic garden of which we have definite record was established by Aristotle, in Athens, some three hundred and fifty years before Christ, and through the opportunities for study which it offered to Theophrastus, became an important factor in the advancement of contemporary botanical science. On the death of Aristotle, the garden, by the terms of his will, was bequeathed to Theophrastus, who improved it in many ways, the expense of these improvements being borne by Demetrius Phalereus, a wealthy and public spirited citizen of Athens.†

The remote ancestry of the true botanical garden is to be found in the earliest attempts to cultivate medicinal plants. Pliny (23–79 A.D.) mentions such a garden owned by Antonius Castor, in Rome, and, early in the Christian era, the monks in Italy began to grow medicinal herbs in the monastery gardens. This practice was subsequently undertaken by the early apothecaries, giving rise to the so-called "physick gardens," for the growing of "simples." Such gardens were naturally utilized to forward the work of instruction in *materia medica*, in connection with the medical schools.

About the sixteenth century occurred a renaissance of the scientific study of plants, and the early herbalists began to cultivate living specimens for botanical study. Thus the modern botanic garden may be traced from the vegetable garden and

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* Reprinted from the Cyclopedia of Education, Vol. I, pp. 421–424, through the courtesy of The Macmillan Co., publishers.

† This paragraph does not occur in the article as originally published.

orchard, through the ornamental garden, the physic gardens and the private gardens of the herbalists, an interesting and very natural parallel to the development of the science of botany itself; for plants were first studied as articles of diet, then as the source of remedies for disease, and only subsequently for their own sake, from the standpoint of the modern botanist.

There are to-day over 200 so-called botanical gardens in various parts of the world, 36 of which are in Germany, 23 in Italy, 22 in France, 16 in Russia, 13 in Austria-Hungary, and 12 each in Great Britain and Ireland, and the United States.

Formal instruction was undertaken by botanical gardens as early as 1545, in the garden at Padua, where lectures on plant life were given, and a crude form of laboratory work undertaken in the form of "*ostencio simplicium*," or demonstrations of medicinal herbs. Even before this date the public study of botany was inaugurated at the garden of Pisa (1543), by order of the Grand Duke Cosmo I., and the second director of this garden was the celebrated botanist Caesalpino, the successor of Ghini who, in 1547, founded the garden at Bologna.

The educational work of botanic gardens falls naturally under six heads:

1. Information by means of well-labeled specimens.
2. Popular lectures.
3. Research work.
4. Periodical and other publications.
5. Courses of lectures and instruction to organized classes.
6. Docentry.

These various phases of botanical education developed in connection with gardens approximately in the order here named.

1. *Information by Means of Well-labeled Specimens.*—A museum has recently been described as a collection of attractive labels well illustrated by specimens. The earliest educational work of botanic gardens was confined almost entirely to what might be accomplished by such means. In other words, the garden was a place where anyone sufficiently interested could go and "educate" himself, *i. e.*, secure without the aid of a teacher a certain limited amount of information about plants. From

the nature of the case, this must always remain a prominent and valuable phase of botanical instruction by gardens. In the early gardens the labels gave only the scientific name of the plant, but subsequently there were added the common name, the geographic distribution, and the place of the specimen in the system of classification—the family to which it belongs.

So long as no attempt was made to illustrate any phase of botany but classification, such labels indicated the limits of information one might obtain, but, as a rather modern development, appearing first in this country in the Missouri, Harvard, and New York gardens, plantations were organized on other bases, such as geographical distribution, relation to environment (ecology), modification of parts (morphology), economic use, both for food and medicine, plant breeding, and the history of botany. Thus the range of information to be obtained from labels was greatly extended. But after all, and at best, the result was for the most part only information about plants, more or less detached and uncorrelated; not botanical education. The general public visit a botanic garden for recreation rather than information, and while these well-labelled plantings do a real service, and meet with a genuine and wide-spread appreciation, they leave much to be desired. They would be justified, however, from the standpoint of education, if they did no more than extend the interest of the public in things botanical, or serve to give an added interest in life.

2. *Popular Lectures*.—As an educational force in botanic gardens, popular lectures are only second, in time of development, to the labelling of specimens. They were introduced as early as 1545 at the Padua garden. At first they were no doubt largely confined to the medicinal properties of plants, illustrated by living specimens from the garden and greenhouses and by dried specimens from the herbarium. Later they have been extended to all phases of scientific botany, from the early spring flowers to botanical exploration and theories of heredity. The introduction of the stereopticon has here, as elsewhere, done much to increase the interest in such lectures. At the free weekly lectures given every Saturday from April to November

at the New York Botanical Garden, the attendance varies from 50 to 500, depending upon the weather, the topic, and somewhat upon the time of the year and the extent of the lecturer's reputation. The average attendance, however, is increasing.

3. *Research.* —Botanic gardens, in the true sense of the word, have always been centers of investigation; otherwise they tend to become merely pleasure parks. The educational work of the early physic gardens was very largely research, while practically no attention was given to popularizing. Thus, when John Gerarde, in the latter part of the seventeenth century, acting for Lord Burleigh, prepared the letter to Cambridge University recommending that a physic garden be established there, the purpose stated was to encourage "the facultie of simpling," and the gardens of Bologna, Montpellier, Leyden, Paris, and Upsala (the seat of Linné's labors), flourished in the middle of the seventeenth century for the primary purpose of aiding teaching and research. Well-equipped garden laboratories for research are becoming more and more common, especially in gardens organically connected with, or affiliated with colleges and universities.

4. *Publications.*—At first these were mainly confined to catalogues of the living plants, then were introduced guides to the grounds, seed lists, lists of plants offered in exchange, guides to the museum and conservatories, and finally monthly and other periodicals, embodying the results of research, and other matters pertaining to the advancement of botany or the organization of the institution.

5. *Courses of Lectures and Instruction to Organized Classes.*—This is one of the latest and most important educational developments of botanic gardens. Regular courses were offered to medical students as early as 1829, in the Chelsea Physic Garden, and this has now become an important phase of activity, especially of all gardens connected in any way with educational institutions. In fact didactic instruction by botanic gardens has developed parallel with the growing tendency to establish them in connection with universities or other educational institutions.

In the earliest and later private gardens practically no attention was given to teaching. In the physic gardens of apothecaries' societies and schools of medicine, the teaching was confined to the nature and properties of medicinal plants, but, with the organization of university gardens and gardens closely articulating with institutions of learning, was introduced formal instruction of classes in various phases of pure and applied botany. The public school system of Pittsburg furnishes what is doubtless a unique instance of botanic garden and laboratory as part of the equipment for science teaching in high schools. The new botanic garden, established by the Brooklyn Institute of Arts and Sciences, while not organically connected with any school, and while planning ample provision for research, was inaugurated primarily as a teaching institution. The plan involves a staff of teachers, as well as of investigators, and the organizing of classes of both elementary and advanced grade.

6. *Docentry*.—Docentry is a comparatively new idea in education, and is confined to institutions devoting a considerable portion of time to the popularizing of knowledge. So far as the writer knows, the New York Botanical Garden was the first, and is to date (1910) the only botanical garden employing docentry. The former system, here as in most other gardens, was that of personal guides for visitors who apply, and aids and gardeners were detailed for this purpose.

Under the new system there is a regularly appointed "docent," who leaves the front door of the museum building every week-day afternoon at three o'clock, with a definite route for each day. Parties may start with the docent, or he may in turn meet with two or three interested visitors, volunteer interesting information concerning the trees and other plants of the collections, and thus assemble an extempore class. The Saturday trip is confined to the museum, herbarium, and library (containing many rare and historically interesting volumes), and is completed in time to permit those who wish, to attend the weekly public lecture at four o'clock.

There is outlined below the educational work of various gardens, in the order of their age. The date indicates the year in which the garden was established.

1. *Jardin des Plantes, Paris (1610).*—As is well known, the Jardin des Plantes is only partially devoted to plants, the botanical work being, in fact, quite overshadowed by the zoölogical. On Sunday afternoons public lectures on botanical subjects are given in the amphitheatre of a special building. These lectures, locally called "conferences," are illustrated by lantern-slides, museum specimens and living plants from the conservatories, and admission to each course is by ticket.

2. *Tokyo, Japan (1638).*—This garden, now the garden of the Imperial University, was established by Tokugana the Third, at Shinogawa, on the southern side of Yedo (modern Tokyo). After the revolution of 1868 it was taken over by the Meji government and was again transferred to the Imperial University in 1869. At this last transfer its old name, *Oyakuyen* ("the medical plant garden"), was changed to *Igakkoyakuyen* ("the medical school garden"). In 1871 it came under the supervision of the educational department of the empire, and in 1875 its name was again changed to *Kaishikawa*, botanic garden. In 1876 it became part of the college of science of the university. Instruction is given to university students in botany, entomology and pharmacy; while the grounds are open to the general public.

3. *Chelsea, England (1673).*—Chelsea is almost unique among the early gardens in the extent to which it organized instruction in various branches of pure and applied botany. The garden was established by the Society of Apothecaries of London, on lines similar to the private gardens of the herbalists, differing from them in being supported by a public society. It was the first public institution of its kind in London, and is now the oldest. As early as 1633 the Society of Apothecaries inaugurated an annual "herbarizing," which was discontinued after a short period; but after the opening of the Chelsea garden these "herbarizings" were renewed, and soon took the form of a demonstration of plants to the members, by the "demonstrator of plants." In 1829 weekly demonstrations were begun, confined largely to the specimens in the *materia medica* department of the garden, followed by a lecture. The successive lectures were planned to form a summer course of study in botany. The titles of the

lectures in one course were as follows: (1) The different systems of botany, both natural and artificial, particularly those of Linnaeus and Jussieu: (2) the structure and growth of plants; (3) the different parts of plants, with their description and uses in the process of vegetation; (4) the natural and chemical analyses of vegetable matter; (5) the medicinal use of the most important articles in the materia medica, etc. These lectures were well attended by medical students, and when Lindley, in 1835 (Encyc. Brit.), was made director of the garden (*Praefectus Horti*), and professor of botany, the lectures were held twice a week at 8:30 A. M. in May, June and July, instead of weekly at 10 A.M. from May to September. At the close of this course an examination was given, optional to the students, and a gold medal worth ten guineas awarded to the candidate attaining the highest grade. The awarding of prizes began in 1830 was discontinued in 1853, but subsequently renewed. It is interesting to note that among the successful competitors were Huxley, Masters, and H. C. Bastian.

In the "Rules and Regulations as to Admission to the Garden, Lecture Room and Laboratory," issued November 20, 1902, it was stated that: "1. The purposes for which the Chelsea Physic Garden is maintained are: (1) To render assistance in the teaching of botany; (2) To provide material and opportunity for botanical investigations; . . . . 4. Teachers holding tickets of admission will be allowed to introduce their students to the garden for purposes of study, but each teacher will be held responsible for any damage that may be committed by his or her students whilst in the garden." Individual students and classes with teachers take advantage in large numbers of the opportunities offered, and in addition specimens are furnished to teachers for class use.

4. *Kew (1759).*—The famous Kew gardens date from the appointment of William Aiton, a pupil of the Chelsea Garden, to organize a physic garden for the Princess Augusta, of Saxe-Gotha, Dowager Princess of Wales. The ornamental garden around the royal residence was utilized for this purpose. The only formal educational work at Kew is the training of gardeners

but this is thoroughly organized, and very important, for Kew is the source of gardeners for most of the colonial gardens. Five years of practical experience is required for entrance upon the course, which includes lectures in physics, chemistry (as related to botany and geology), general botany, economic botany and geographical botany. Each student is required to collect a herbarium of 250 named and mounted specimens, and, if his work is satisfactory, he receives a Kew certificate at the end of two years. Kew remained a private possession of the crown until 1840, when it was made a public garden, with Sir William Hooker as the first director.

5. *Edinburgh* (*1763*).—This garden is a part of the University of Edinburgh. It has museums, class-rooms and laboratories, where most of the instruction in botany in the university is given.

6. *Harvard* (*1805*).—Established and continued primarily to further botanical teaching and research in Harvard University.

7. *Buitenzorg, Java* (*1817*).—The 'sLands Plantentuin, at Buitenzorg, is the finest botanical garden in the world. It has well-equipped laboratories for research, a botanical library of over 40,000 volumes, and one large building devoted exclusively to laboratories for visiting botanists from other countries. Certain European governments send annually a student to Buitenzorg, and other countries are represented at irregular intervals. The work is almost entirely research.

8. *Missouri, St. Louis, Mo.* (*1859*).—These gardens are known locally as "Shaw's Garden," in honor of the founder, Henry Shaw. Among the objects named in the enactment that established the garden is the dissemination among men of a knowledge of plants "by having a collection thereof easily accessible; by the establishment of a museum and library in connection therewith, and also by the establishment of public lectures and instruction upon botany and its allied sciences." In 1885 the same benefactor endowed the Henry Shaw School of Botany, at Washington University, St. Louis, and provided for the coöperation of this school with the botanical garden. The professor in the Shaw School of Botany is the director of the garden. In addition to serving the needs of the students and staff of the

Shaw School of Botany, the garden grounds are open to the public, and the founder's will provides that there must be preached an annual sermon on the power, wisdom and goodness of God as shown in the growth of flowers, fruits and other products of the plant world. The collections are freely used by the teachers with their classes in nature study.

9. *Montreal (1885).*—It was the intention of the founders of this garden to make ample provision for formal instruction in botany, pure and applied, but the institution was under municipal control, and finally "killed by political differences in the city council."

10. *The New York Botanical Garden, Bronx Park, N. Y. City (1894).*—The forerunner of this garden was the "Elgin Botanic Garden," of Dr. David Hosack, in New York City (the present borough of Manhattan). The garden was successively transferred to New York state and then to Columbia University but was finally abandoned for lack of money. The present garden has a coöperative agreement with Columbia University. The herbarium and botanical library of the university are deposited with the garden, and the university students and staff in botany enjoy, without any additional fees, all the privileges of the garden. The undergraduate courses are all given at the university, but much of the research is carried on at the garden. Weekly lectures on "popular" and semi-popular botanical subjects are given on Saturday afternoons from April to November. The system of docentry, inaugurated in 1910, has been referred to above.

Probably the most elaborate attempt ever made on the part of an institution of this character, to coöperate with and aid the nature-study work of public schools are the courses of spring and fall lectures given to the teachers and pupils of grades 4B and 5B of the city schools. In the annual report of the director-in-chief for 1904 it was recommended that, "lectures designed with special reference to the need of teachers and their pupils, might be given with advantage," and, on March 29, 1905, the board of education of the city passed resolutions empowering the principals to arrange for the lectures. At the close of the

first course the district superintendent reported that the results were most gratifying, the children, in some instances, being stimulated to make collections of fungi, ferns and mosses, and to cultivate window boxes further illustrating the subjects of the lectures.

There were two courses arranged; one of two lectures and demonstrations to grade 4B, and one of three lectures and demonstrations to grade 5B. After a lecture, illustrated with the stereopticon, and given by a regular member of the garden staff, the pupils are taken out on the grounds in groups of thirty to forty, where demonstrations are given on the subject of the lecture. This work is followed up during the next week in the class-room.

During the first year the lectures were given to the pupils of Bronx Borough only, but in 1906 the privilege was extended to the public schools of Manhattan, and the afternoons of four days of each week were given over to the lectures. The pupils, accompanied by their teachers, come on trolleys, elevated roads, and subway, each paying his own fare, and, notwithstanding this fact, and the further fact that attendance is optional with the pupils, the attendance increased from about 5,000 pupils in 1905 to nearly 13,000 (9,378 from the Bronx, and 3,391 from Manhattan) pupils and teachers in 1906. During 1906 the work was inspected by many teachers, including several from Europe, and the course was repeated on Saturday mornings for teachers unable to be present on the afternoons regularly scheduled. The attendance of pupils from Manhattan was not continued, owing partly to the long ride on the elevated railroad. It should be stated that there is no record of any mishap to the pupils in going to and from the garden. In 1909 7,273 pupils and 235 teachers from grade 4B, and 9,622 pupils and 341 teachers from grade 5B, or a total of 16,895 pupils and 576 teachers attended these lectures.

11. *The Brooklyn Botanic Garden* (*1910*).—This garden was established by The Brooklyn Institute of Arts and Sciences, in coöperation with the municipal government of Greater New York. It is the primary purpose of the garden to combine instruction to

classes in botany with research work, and to assist in every practicable way the botanical work of local schools, both public and private. The plans provide for the organization of a staff consisting, not only of investigators to have charge of research, but also of members whose primary duty will be the conducting of classes in various branches of the science, including courses for beginners. Ample provision is made for carrying out this purpose in the plans for the laboratories, greenhouses and plantations.

In addition to the institutions referred to above, there should be mentioned the gardens at Oxford and at Cambridge (England), at Munich, Amsterdam, Berlin, Vienna, Geneva, St. Petersburg, and Montreal (McGill University), nearly all of which are affiliated with universities and are centers of botanical instruction and research; while well-organized gardens are found at the Michigan Agricultural College (Lansing, Mich.), the University of California (Berkeley), the University of Pennsylvania (Philadelphia), and Smith College (Northampton, Mass.). The educational work of the Royal Botanic Society's Gardens, at Regent's Park, London, is also extensive, covering popular lectures, the supplying of materials to classes in schools, and the organization of a practical school for the training of gardeners. Educational exhibits are also held here from time to time to illustrate the nature-study of the local public schools.

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C. STUART GAGER.

BROOKLYN INSTITUTE OF ARTS AND SCIENCES,
BROOKLYN BOTANIC GARDEN.

SPRING LECTURES, 1911.

Lectures will be delivered in the lecture hall of the museum building of the Garden, Bronx Park, on Saturday afternoons, at 4:00 o'clock, as follows:

April 29. "The Preservation of Our Native Plants," by Dr. N. L. Britton.

May 6. "What is Botany?" by Dr. C. Stuart Gager.

May 13. "Transforming an Old Swamp," by Mr. George V. Nash.

May 20. "The Reef-building and Land-forming Seaweeds," by Dr. Marshall A. Howe.

May 27. "The Influence of Soil Acidity on Plant Distribution," by Mr. Frederick V. Coville.

June 3. "How Plants are Distributed," by Prof. Carlton C. Curtis.

June 10. "The Royal Gardens at Kew, England," by Dr. William A. Murrill.

June 17. "Collecting in the High Mountains of Colorado," by Mr. Fred J. Seaver.

June 24. "Past Climatic Conditions Indicated by Fossil Plants," by Dr. Arthur Hollick.

The lectures will be illustrated by lantern slides and otherwise. They will close in time for auditors to take the 5:35 train from the Botanical Garden Station, arriving at Grand Central Station at 6:03 P. M.

The museum building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the Subway change to the Elevated Railway at 149th Street and Third Avenue.

NOTES, NEWS AND COMMENT.

Mr. B. O. Dodge has been awarded a research scholarship at the Garden for the month of June.

Dr. G. P. Clinton of the Connecticut Agricultural Experiment Station visited the Garden Friday, April 7, and spent some time looking over specimens of fungi in the Ellis Collection.

Number 25, volume 7, of the Bulletin of the New York Botanical Garden, containing the annual report of the director-in-chief and other official documents was issued March 16, 1911.

Dr. and Mrs. N. L. Britton returned April 4, from Cuba where several weeks were spent in botanical exploration. A large number of living plants were secured for the conservatories as well as extensive collections of dried plants for the herbarium.

The regular monthly conference meeting was held in the library on Wednesday, March 1. At this meeting Dr. M. A. Howe

described and showed specimens of "A Little-known Mangrove of Panama." The entire paper appears in this number of the JOURNAL.

A letter has lately been received from Dr. Charles B. Robinson, formerly a member of the Garden staff, stating that he expects to return to this country about the end of July. Dr. Robinson has been in the service of the Philippine Bureau of Science for over three years and it is understood has been collecting this spring along the Indo-China coast, a region very little known botanically.

Mr. Norman Taylor, for some time past assistant curator at the New York Botanical Garden, has recently been appointed curator of plants in the Brooklyn Botanic Garden having assumed the duties of his new position March 16.

Mr. Taylor has been in the service of the New York Botanical Garden for the past six years. For two years he held the position of custodian of the plantations. In 1909 he was appointed an assistant curator, of the museums and herbarium, and has devoted much time to the building up of the herbarium of local plants. In this connection he has been considering the various factors which bear upon the distribution of our local plants.

At various times he has aided in carrying on botanical explorations in the West Indies, one trip being made, in company with Mr. George V. Nash, to the Bahama Islands in 1904 and another to the republic of Hayti in 1905. In company with Dr. Fernow, he made a trip to Cuba during the summer of 1906, and in 1909 carried on explorations in Santo Domingo.

In addition to numerous papers on various phases of local flora work, he has monographed several families of plants for North American Flora. In 1909 he prepared for publication in the Garden BULLETIN an extensive and well-illustrated paper on the "Native Trees of the Hudson River Valley." He has also assisted very successfully with the demonstration work in connection with the public school lectures.

Meteorology for March.—The total precipitation for the month was 3.67 inches. Maximum temperatures were recorded of 57.5° on the 9th, 56.5° on the 15th, 70° on the 22d and 55.5° on the 30th. Also minimum temperatures were recorded of 16° on the 7th, 15.5° on the 17th, 17° on the 25th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

571 specimens of *Crataegus* from the Southern States. (By exchange with the Biltmore Herbarium.)

51 specimens of flowering plants from British America. (By exchange with the Geological Survey of Canada.)

55 specimens of *Crataegus* from Michigan. (By exchange with Mr. C. K. Davis.)

25 specimens of *Crataegus* from Connecticut. (By exchange with Mr. C. H. Bissell.)

50 specimens of *Crataegus* from Pennyslvania. (By exchange with the Carnegie Museum, Pittsburgh.)

17 specimens of *Crataegus* from Ohio. (By exchange with the University of Ohio.)

835 specimens of Montana plants. (Collected by Mr. B. T. Butler.)

1458 specimens from western Cuba. (Collected by Mr. Percy Wilson.)

206 specimens of *Rubus* from eastern North America. (Given by Mr. E. P. Bicknell.)

100 specimens "North American Uredinales," Century I. (Distributed by Mr. Elam Bartholomew.)

2 specimens of Florida plants. (Given by Mr. Henry Nehrling.)

4 specimens of flowering plants from the western United States. (Given by Mr. George V. Nash.)

2 specimens of *Alloplectus* from Costa Rica. (Given by Captain John Donnell Smith.)

8 specimens of conifers from Georgia. (By exchange with Mr. H. A. Allard.)

1 photograph of *Gyrostachys cernua* from New York. (Given by Miss Helen Ingersoll.)

7 photographs of *Vanilla planifolia.* (Given by Mr. J. Manheimer.)

15 specimens of mosses from Connecticut. (By exchange with Dr. George E. Nichols.)

140 specimens of flowering plants from Arctic America. (By exchange with the University of Christiania.)

JOURNAL

OF

The New York Botanical Garden

VOL. XII. May, 1911. No. 137.

BOTANICAL EXPLORATION IN CUBA.

TO THE SCIENTIFIC DIRECTORS,

Gentlemen: In continuation of the botanical exploration of the West Indies, I spent the latter part of February and the month of March, 1911, in western and central Cuba, sailing from New York on February 18 and returning on April 4. Mrs. Britton accompanied me as on previous expeditions, and we were fortunate in having with us Mr. John F. Cowell, director of the Buffalo Botanic Garden, who had previously coöperated in our exploration work on the islands of St. Kitts and Porto Rico.

We reached Havana on February 22 and the day was spent in company with Brother Leon, of the Colegio de la Salle, in a visit to the coastal hills and river valley east of Vedado. Brother Leon guided us to a single specimen of what appears to be a rare cactus with sharply four-winged stems which I had on a previous occasion observed in the vicinity of Cojimar, east of Havana, but had failed to establish the species in our collections. The plant forms a bush three feet high or more, but it was neither in flower or fruit at this point and, as in my previous observation of the species in Cojimar which was in the same barren condition, I am as yet unable to classify it. Fine specimens of the coastal *Agave* of this portion of Cuba (*A. Legrelliana*) were secured.

We also examined the important herbarium of Cuban plants collected by Brother Leon during several years for his college; duplicates of most of these specimens have been contributed by him to our collections and we are indebted to him and to his associates at the Colegio de la Salle for kindness and hospitality.

On February 23 we visited the two botanical gardens of Havana and were received with much cordiality by Dr. Felipe Garcia Cañizares, director of the Secondary School Garden, and by Dr. Gomez de la Maza, director of the garden of the university. Observations were made on a large number of plants in these collections and further coöperation in our work in Cuba was discussed and arranged. Dr. de la Maza presented us with a large map of the island of Cuba, showing the judicial districts of the island in detail.

On February 24, accompanied by Brother Leon, we visited the Sierra de Anafe at Guayabal in the extreme eastern part of the Province of Pinar del Rio, traveling about twenty-two miles by trolley. This is the eastern ridge of the limestone sierra which extends uninterruptedly westward through Pinar del Rio to the city of Guane. The most interesting plant observed here was another cactus, unfortunately, neither in flower or fruit, forming a tree-like plant ten or twelve feet high, repeatedly forked into very slender branches. A large *Agave* was abundant and a beautiful palm of the genus *Thrinax* clothed the jagged limestone rocks along a precipitous crevice. A small trailing vine-like *Sida* carpeted portions of the bottom of this crevice and we hope to be able to grow it under greenhouse benches, as it occurs in deep shade.

The base of operations from February 26 until March 19 was established at the city of Pinar del Rio where some time was spent last September.* Some of the ground traversed at that time was reëxamined for the observation and collection of certain plants at this different time of the year, but most of our time was given to new ground. The dry weather which had continued in Pinar del Rio since last October had parched the vegetation of hillsides, mountains and savanna and it was mainly along water courses and arroyos that plants could be found in flower. We were fortunate here in making the acquaintance of Dr. Eugenio Cuesta, the teacher of natural science in the secondary school, and he aided us greatly by information, advice and companionship.

*See Journal N. Y. Bot. Gard. 11: 230–235. 1910.

The valleys of several streams yielded specimens of a considerable number of interesting species not found in flower during our previous visit to this region. Among these, a beautiful white-flowered shrub of the Heath Family, similar to the Leucothoës of the southeastern states, and perhaps in the same genus, was a fine floral feature. The beautiful tree-fern of these lower elevations, observed sparingly last time, was found in abundance and a number of trunks were brought with us for cultivation. Additional plants of a *Furcraea*, of interest because pronounced by Professor Trelease, of the Missouri Botanical Garden, to be apparently different from the known Cuban species of this genus, were obtained; a bright yellow-flowered St. John's-wort (*Hypericum*), forming a shrub three feet high and exceedingly floriferous was frequent along the rocky stream banks; one cliff in the valley of the Rio Mestanza which furnishes the water supply for the city of Pinar del Rio, was covered with a tail-flower (*Anthurium*) different from any species with which we are familiar and a good supply of this was taken for cultivation; a species of prickly pear (*Opuntia*) having most of its joints spineless interested us greatly as distinct from other Cuban species of this genus, its fine yellow flowers very conspicuous; many kinds of ferns, mosses and lichens were collected in the arroyos.

But by far the most interesting plant observed and collected in the region was the tall cycad of western Cuba (*Microcycas calocoma*). We had long known of the existence of this remarkable plant, but had never before succeeded in seeing it in its natural habitat; it grows in valleys in oak and pine woods on shaly soil at an elevation of about 600 feet above the sea and is locally abundant. The tree attains a maximum height of about 20 feet, usually forming a simple trunk which tapers somewhat toward its summit and is there crowned by a magnificent tuft of large pinnate leaves sometimes as many as one hundred in the tuft; its general aspect is similar to that of the common sago palm of the greenhouses (*Cycas revoluta*), but the trunk is more slender and the leaves more numerous; when fruiting, the pistillate plants form very large cones, often a foot long or more; these from their resemblance to pineapple are called "piñas" by the Cubans

whose name for the plant is "palma corcha." We were so much interested in this rare tree that three different expeditions were made to its localities and three valleys containing it were visited; by the aid of friendly Cubanos, a team composed of a cow and a young bull drawing a wooden drag, an abundant supply of the trunks was brought out from the hills and transported by cart to the city and subsequently shipped to the Garden, the largest taken being seven or eight feet tall.

From the city of Pinar del Rio trips were made in several directions. On March 4 and 5 we explored the limestone Sierra and river valley at Guane, the terminus of the railroad. The flora of the Sierra is similar to that of the mountains near Viñales, visited last September, but with a number of additional elements; the same little *Agave*, identified by Professor Trelease as *A. Wildringii*, was abundant, as well as the slender mountain palm, *Gaussia princeps*. The most attractive floral feature at the time of our visit was a small tree of the genus *Tecoma*, flowering freely while essentially devoid of leaves, the large light pink flowers conspicuous against the steep dry rocky slopes. The water-fall of the Rio Portales was very attractive and the rocks were clothed with a variety of small plants, among these, a white-flowered *Aster*, strongly resembling some of our numerous northern species; three species of palms were abundant in the vicinity. On March 7 the river swamps in the vicinity of Galafre were explored; here we were especially interested in a beautiful wild fig (*Ficus*), its leaves with nearly white veins, making it apparently desirable for ornamental greenhouse cultivation; we subsequently observed this tree at other points and obtained ripe seeds which we hope will germinate.

Leaving Mrs. Britton at Pinar del Rio, to care for the collections Mr. Cowell and I made two trips on a fishing schooner on the south coast, from the little port of Coloma. The first of these was made on March 1 and 2 to Cayo Real, an island of an archipelago some twenty miles south. We found this cay, however, to be composed wholly of sand-dunes and mangrove swamps with the ordinary vegetation of such formations, but our disappointment was much modified in returning from Coloma to Pinar del

Rio by the discovery of a wonderfully beautiful orchid growing on the trunk of the pond apple (*Anona palustris*) in a little marsh. The orchid was in full bloom, its flowers of a bright magenta, forming clusters a foot or more long, the individual blossoms more than an inch across. Only four individual plants could be found after a long search and these were all on one tree. The plant seems to be in the genus *Broughtonia* and is apparently undescribed.

The second schooner expedition occupied the period from March 8 to March 16, sailing west from Coloma as far as the Bay of Corrientes, near the western end of the island, touching, both going and coming, at the Laguna de Cortes, near Cape Francis, but at no other intermediate points, because from just west of Cape Francis to Cape Corrientes the coast is an unbroken vertical escarpment, with no harbors and no way of landing upon it safely, except when the wind blows from the north or northwest, which is unusual. Along Corrientes Bay, after we had rounded the Cape, after sailing against the strong current for some time, we found the rock wall setting back from the coast and landed at four different points and were thus able to obtain a good view of the vegetation and to make quite extensive collections. The flora was quite varied, containing many species common to the coastal woodlands and thickets of other parts of Cuba, but also a number of others with which we are unacquainted and which will form interesting objects for study. The stout "palma cana," a palm of the genus *Sabal*, related to the palmetto of Florida and the Bahamas, occurs here in large groves in places almost to the exclusion of other trees, so striking in appearance from the sea that one of the headlands is known as Punta Cana. In moist, marshy situations, immediately behind the sand-dunes, the coastal thatch palm, "palma lana" (*Thrinax* sp.) so-called from the velvety coating of the inner surface of its leaf sheaths, was exceedingly abundant, its slender trunks attaining a height of 40 to 50 feet, and with it the "palma blanca" (*Copernicia* sp.) attained almost equal height. Two cactuses were abundant on the rocks, one an upright bushy *Harrisia*, the other a trailing and climbing *Selenicereus*, both night-flowering species, but not in bloom at

the time of our visit. A number of attractive orchids inhabited the trees, the most conspicuous being an orange-flowered *Cyrtopodium*. The schooner provided convenient transportation for bales and boxes of living plants, and all the collections made were safely transported to Coloma and then by cart to Pinar del Rio, the only trying feature of the trip being the beat to windward in returning, this necessitating three times as many hours as the run before the trade wind took in sailing westward.

During our absence on the Corrientes expedition, Mrs. Britton and Dr. and Señora Cuesta had made a number of interesting collections in the vicinity of Pinar del Rio, and March 16, 17 and 18 were given to further exploration work along streams in the vicinity of that city. On March 19 all the collections made were packed, taken with us to Havana on March 20, shipped to New York, and we proceeded the same day to the city of Santa Clara, in order to obtain some additional observations and collections of plants of that province, studied by us on a previous trip.*

A considerable number of species of shrubs and trees were found in flower in the vicinity of Santa Clara, especially along water courses, different from those previously obtained by us. Fruiting specimens of the *Agave* abundant on the rocky hills were obtained to supplement the material of this species collected last year. A noteworthy floral feautre in the palm barren at Santa Clara was a beautiful blue-flowered shrub of the genus *Jacaranda* in the Bignonia Family, and an abundant supply of this was collected; it appears to be quite unknown to botanists and was one of the most interesting species observed during our trip.

In order to obtain a rare palm growing on the banks of the Rio Damuji at Cienfuegos Bay, Mr. Cowell, Professor Earle and I proceeded to Cienfuegos and, by using a small river steamer, succeeded in obtaining a number of trunks and very perfect flowering specimens. A palm of the genus *Paurotis* grows on the border of a bog in great abundance, together with a number of other interesting plants; using the same river steamer, we pro-

*See Journal N. Y. Bot. Gard. 11: 109–117. 1910.

ceeded the whole length of Cienfuegos Bay to the village of Castillo de Jagua, which was used as a base last spring while we were exploring the southern coast of Santa Clara, and here additional material was collected of the undescribed *Agave* of that region, the plants being in fruit, and also of a much branching cactus characteristic of this region. A stop was also made at Punta Gorda, on the eastern side of Cienfuegos Bay, where trunks of another palm, perhaps *Copernicia*, were dug out and fruiting specimens obtained. Returning to Santa Clara by way of the city of Santo Domingo, a few hours were given to collecting in an arroyo near that city.

We reached Havana on the evening of March 28, and on March 29 went to the Playa deMarianao for a reëxamination of the coastal flora at that point. On March 30, accompanied by Brother Leon, we again visited the Sierra de Anafe, near Guayabal, previously visited on February 24, and obtained some additional specimens. We are indebted to Mr. Arthur Shaler Williams, of Guayabal, for much information and kind hospitality. On March 31, Dr. Cañizares presented us to his Excellency President Gomez, who expressed great interest in our work, and we discussed Havana parks and gardens with him. The afternoon was given to a visit to Cojimar, on the north coast, east of Havana, where additional specimens of a cactus previously obtained were secured, and at Guanabacoa nearby, a supply of trunks of one of the most characteristic of all Cuban palms (*Copernicia macroglossa*) was obtained. On the morning of April 1 we paid another visit to the Botanical Garden of the University, obtaining cuttings of two cactuses which are growing there to perfection, said goodbye to the director, Dr. Maza, boarded the steamer for our return voyage to New York, and reached home on April 4. Altogether, 775 collection numbers were secured, comprising about 1800 specimens. The living plants have been divided with the Buffalo Botanic Garden, and there are many other duplicates available for exchanges with other institutions.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

May 2, 1911.

MANUFACTURE OF RUBBER FROM THE GUAYULE PLANT.

The guayule plant, *Parthenium argentatum*, occurs in the central plateau of Mexico, and in its extension, the Stockton Plateau of Texas. There has recently been established at Marathon, Texas, a factory for the manufacture of rubber from the plants which grow in that vicinity, embracing the whole of the area of distribution in Texas. Through the courtesy of Mr. W. H. Stayton, I have been able to transmit to the museum of the New York Botanical Garden a suite of specimens illustrating the various stages in the process of manufacture. The more important steps in this process are as follows.

The shrub is collected in the field by pulling it up by hand. It is then brought to a central point, called a guayule camp, where it is packed into bales in the fashion of baled hay. From this point, it is hauled to the factory, a distance of 50 to 100 miles according to the location of the camp. Arrived at the factory, the weight of each bale is recorded for the purpose of comparison with the field weight at the time of baling and for the purpose also of establishing data so as to show the percentage of returns. The bales are stacked in the factory yard until seasoned, since the extraction does not go on well if the fresh shrub is used.

The first step in the actual factory process is a crushing of the shrub between corrugated rollers moving at differential speed. The comminuted shrub, a sample of which is shown in jar no. 2, is then placed in a pebble mill. This is a short drum, containing a charge of Norwegian or Mediterranean flint pebbles, a certain amount of water and the amount of shrub to be ground. The mill is rotated on its axis at a certain rate of speed for certain length of time, at the end of which the shrub is found to be finely ground and the rubber more or less separated from the the bagasse, that is, the fiber, *et cetera*, of the shrub, and occurs in the form of small rounded particles, more or less adherent to each other, called "worm-rubber." The mill is now discharged, the water, rubber and bagasse being led through ditches to a skimming tank. This material, as it passes from the pebble mill to the skimming tank, is illustrated in jar no. 3. It will be

noticed that the material in this jar no. 3, in part sinks, namely the fibrous bagasse, and in part floats, the rubber, or rather the chief portion of it and cork bagasse. It is thus that in the skimming tank the major portion of the ground shrub is separated from the rubber, which floats and is accompanied by flakes of cork (cork bagasse). This is shown in jar no. 4, while the fibrous bagasse, which sinks because of being water logged, is shown in jar no. 5. The fibrous bagasse is then discharged, the floating material (rubber and cork bagasse) is boiled for one hour and then allowed to remain one or two days in a settling tank. The material which remains floating is then placed in a compressor with water and subjected to a pressure of 250 pounds, with the result that the cork bagasse is water logged. The result of this operation is the practically complete separation of the rubber from bagasse. This rubber is shown in jar no. 7, while the cork bagasse which accompanied it is shown in jar no. 8. The practically clean rubber, illustrated in jar no. 7, is then further cleaned by being passed through a beater-washer. This is merely an iron tank, with an undershot paddle-wheel with a great many blades. The wheel is rotated rapidly, thus causing the circulation of the whole mass and, by agitation, the separation of the rubber and bagasse, which still remains associated with it. The now entirely clean rubber is finally run through a pair of finely corrugated steel rollers, which sheets it. In this condition it is ready for the market and is shipped in 200-pound sacks. The rubber in condition ready for market is illustrated in jar no. 9.

DESCRIPTION OF SPECIMENS.*

1. Guayule plants ("shrub") as they come in from the field.
2. Ground shrub, through two two-roll crushers.
3. After passing through the pebble mill, discharge of water bagasse and rubber.
4. Skimming tank surface, rubber and floating bagasse (cork flakes).
5. Sinking bagasse from 4.
6. No. 4 after one hour boiling and one to two days in settling tank to prepare for compressor.
7. Rubber skim after forty minutes in compressor under 250 lbs.
8. Water logged "floating bagasse" of no. 4, after forty minutes in compressor
9. No. 7 after beater-washer and sheeted ready for the market.

FRANCIS E. LLOYD.
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*Specimens on exhibition in case 20 of the Economic Museum.

AN UNUSUAL PINE.

During a visit some time ago to the New York Botanical Garden, while passing through the glass houses in company with Professor Britton, my attention was attracted to a curious specimen of a pine, *Pinus pinea*. From the illustration of this plant (Fig. 24), there are evident two kinds of branches with respect to the size and shape of the leaves which they bear, and it is this which produces the unusual appearance. It is unusual, however, only in a quantitative sense, as seedling pines (and frequently other conifers) always bear two kinds of leaves. This dimorphism has an interesting bearing on the geological history of the genus *Pinus* and the closely related genus *Larix* or larch, a matter which has been very much discussed by the morphologists.

Turning to the example in our illustration it will be noted that the lower branches are studded with short stiff leaves, except in a very few places where longer, twisted ones occur. These are like those of the upper branches and chief stem, and, as in the pines in general, are arranged in groups, or fascicles. Examination of the specimen would show that, wherever a fascicle occurs on the lower branches, it would, in each case, be found in the axil of one of the shorter leaves which occur singly. The explanation of this lies in the morphological nature of the fascicle, which is really a very short branch bearing brown, papery sheath-scales (which fall away in, *e. g.*, the white, and are persistent in the yellow pines), surrounding the basal portions of two, three, (occasionally four) or five long, slender green leaves, or "needles." In one species, *Pinus monophylla* Torr. & Frem., there appears to be but one leaf, but by closer examination a vestigial second leaf may be found, enclosed within the sheath, the exception thus proving the rule. In the case before us, there are three needles in the fascicle. It is of significance that *Pinus pinea* and *P. monophylla* are members of the same sub-section according to Engler & Prantl.

In all seedling pines the first foliage leaves formed, after the cotyledons, are single, so that during its early development, the

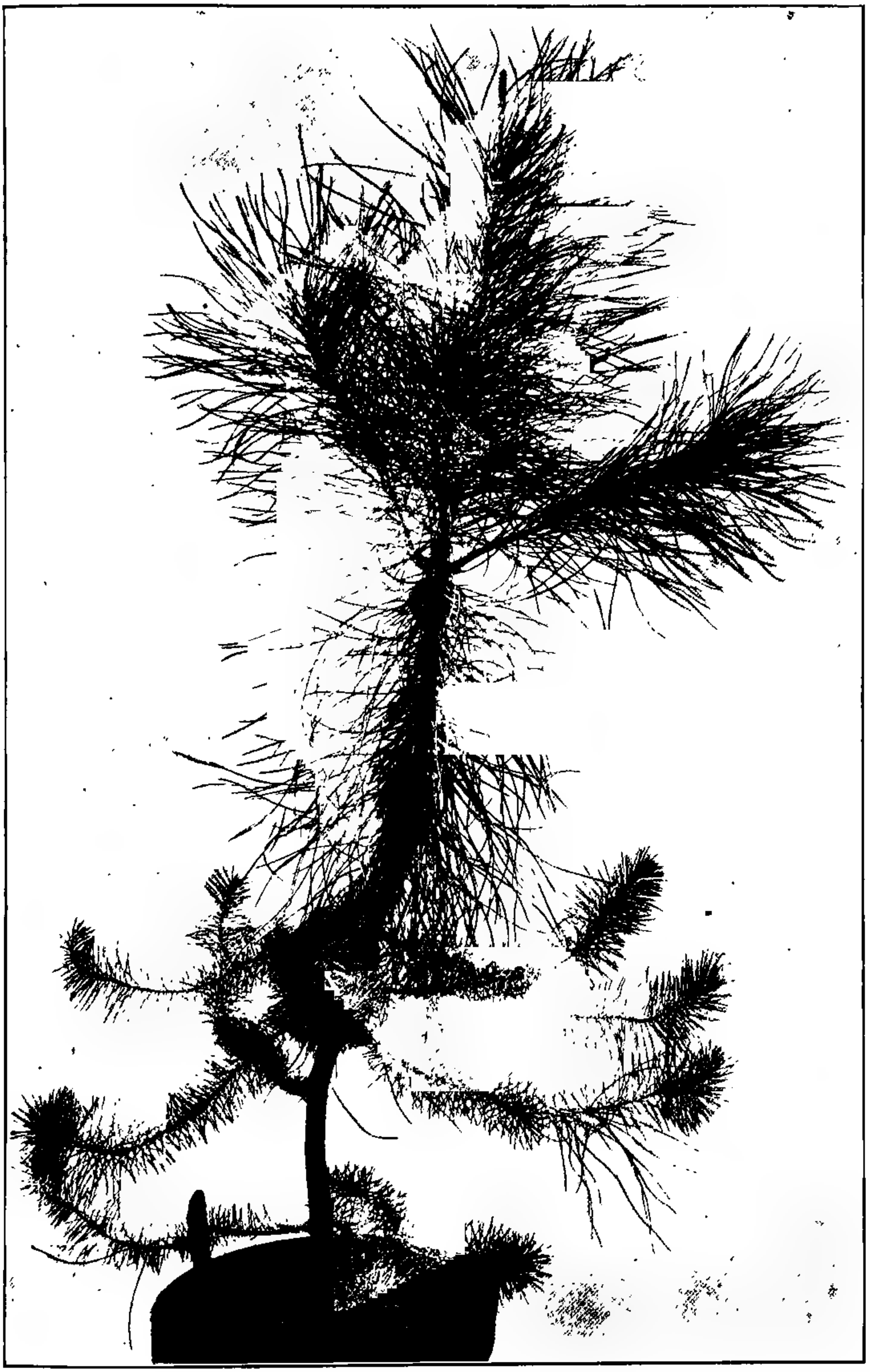

FIG. 24. A young plant of *Pinus pinea*, growing in the glass houses of the New York Botanical Garden. The lower branches bear chiefly primordial leaves, while the upper bear fascicles.

chief shoot has the appearance of the lower branches in our illustration (Fig. 25).

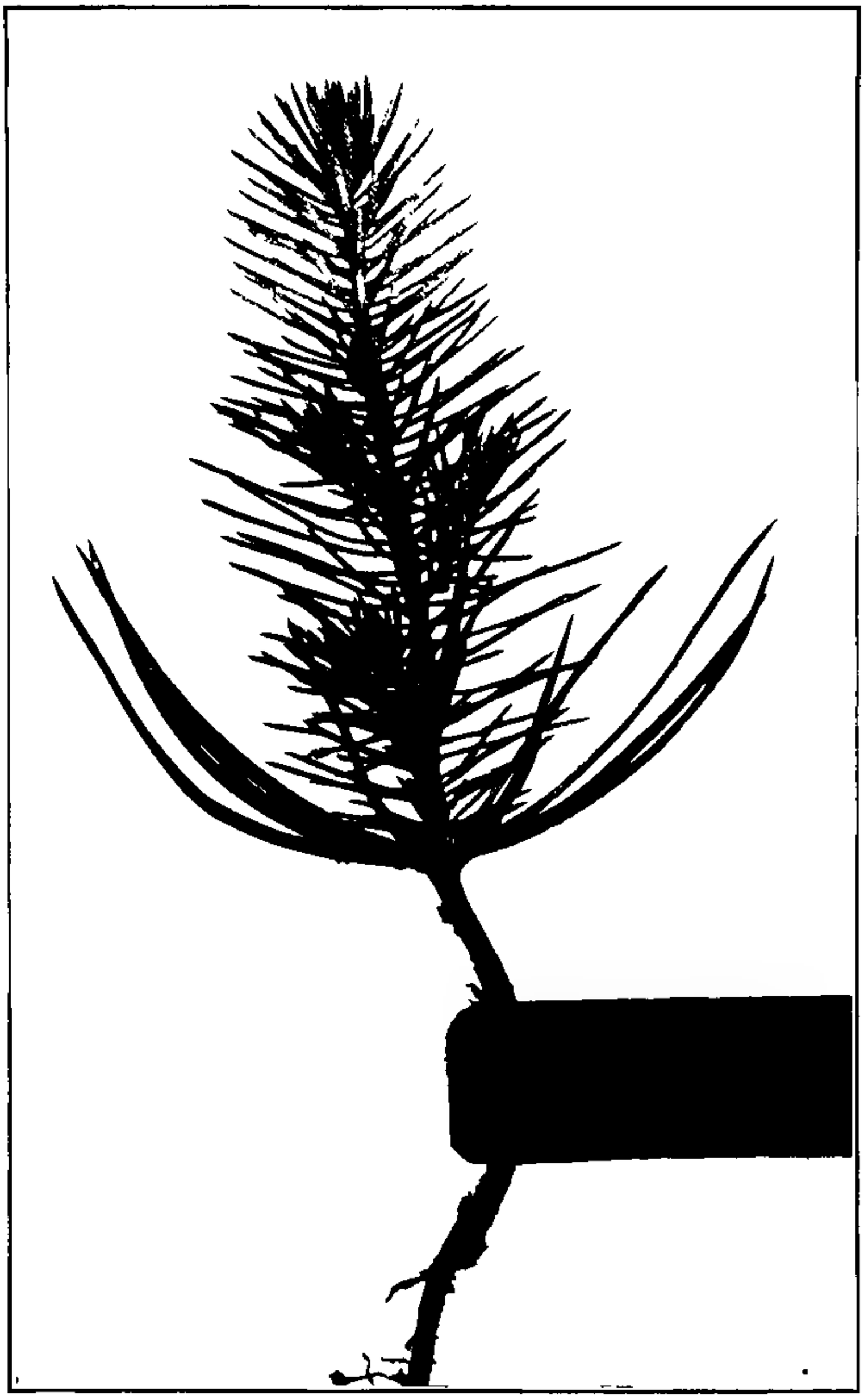

FIG. 25. Seedling of *Pinus Coulteri* (?) showing the cotyledons and primordial leaves of the primary shoot and its earlier branches.

After a shorter or longer period, according to the species, the fasciculated leaves appear, usually after the first season of growth. During the earlier periods of germination therefore, only the flattened, primordial leaves are to be seen.

The ability to produce these primordial leaves is not, however, confined to the seedling. I have shown, for example, that in one of our western pines, *Pinus ponderosa*, shoots, which normally would bear only thin, brown, papery scales, namely the shoots which bear the male, or pollen-bearing cones, may be made to produce true primordial leaves by the mere pruning away of the upper part of the shoot early in the spring. It is thus possible, experimentally, to cause a shoot, which normally would produce if any, only fasciculated leaves, to produce the flattened, primordial kind of leaf. A comparison at this point with our larches will show that what may be induced experimentally in the pine is normally produced in these trees, for the new shoots of the larch always produce leaves which are not fasciculated and which produce the morphological equivalents of pine fascicles in the form of short spurs. It is interesting in this connection also to recall that certain fossil forms found in Siberia, which are, it is probable, either the progenitors of the pines or at least lie close to the family stem, produced normally both kinds of leaves. After the fashion of the larch, the plant which has caused the writing of this short paper, *Pinus pinea*, we may regard as harking back to an unusual degree during its earlier development, to this geological type, but only in a quantitative sense does this plant differ from seedling pines in general.

In similar fashion a number of species of our native pines, after they have been cut down, produce water shoots in the manner familiar to us, following the cutting down of many of our deciduous trees. These shoots also bear at first only the primary leaves.

This condition, which may be induced in some pines by wounding, occurs normally in certain species in our southeastern states. Here a second growth is frequently induced by the protracted season, and the autumnal shoots, as well as the earlier spring growth on smaller plants, bear flattened primordial leaves, some of which may produce fascicles in their axils, though many do not.

The general subject, suggested by the behavior of the specimen before us of the heteromorphy of coniferous leaves, is one of

great interest about which much might be written. We may recall, as a further example of this phenomenon, the cover-scales of the firs and of the western *Pseudotsuga*. In these the cover scale is very leaf-like, especially, *e. g.*, in *Abies bracteata*, and resembles more closely the primordial leaves than the fasciculated leaves, if we may judge by analogy with *Pinus*. In this genus, as in the larch, the cover scales are to be seen, without dissection, only in the young seed cones, as they are overtopped and finally quite hidden from sight by the more rapidly developing seed scales.

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CONFERENCE NOTES.

At the regular conference held April 5, Mr. F. D. Kern gave a further report on some of his recent work on *Gymnosporangium*, a genus of plant rusts. This genus of rusts is commonly known as the cedar-apple rusts, since several species of the genus give rise to gall-like growths known as cedar-apples.

Like most rusts, those of this genus are, with one exception, heteroecious: *i. e.*, have the different stages in their life cycles borne on different host plants. The life cycle of these rusts consists of two stages, the aecial and the telial, the former appearing, as a rule, on the members of the Apple Family and the latter on the cedar. One, however, is autoecious: *i. e.*, has both stages on the same host, the cedar. The aecial stage is not entirely limited to the Apple Family, one having been found on a member of the Rose Family and it is probable that others may also occur outside of the Apple Family.

Many rusts have in addition to the aecial and telial stages, a third stage, known as the uredinial or repeating stage. The spores of this stage germinate immediately and by means of this stage the rust is enabled to spread over extensive areas in a short time. On account of the absence of the repeating stage in *Gymnosporangium*, the cedar-apple rusts are unable to exist unless the two kinds of host plants, apples and cedars, are grown

in close proximity. While the repeating stage is wanting in the known species of this genus, it is possible that it may have existed in the past. Its absence may be partially compensated by the long peridia of the aecial stage and the proportionately large number of spores produced. The telial stage of *Gymnosporangium*, unlike that of other rusts is not a resting stage but the spores germinate as soon as matured. The life cycles of these rusts were outlined carefully and compared and, so far as possible, homologized with those of other groups of plants.

Much attention was given to the question of the distribution of the species of the genus which would depend largely upon the distribution of the hosts on which the rusts occur. The rusts of this genus would not be able to exist except where the distribution of the two hosts required to complete their life cycles overlap.

A study of the genus has revealed forty species for the world, thirty-one of which are found in North America. Three are common to America and Europe and several are found exclusively in India and Japan. The entire paper will be published in the BULLETIN of the Garden.

Dr. W. A. Murrill spoke on the mounting of fleshy fungi in the herbarium and exhibited a number of devices recently introduced for this purpose in the Garden herbarium. The difficulty of mounting agarics for the herbarium in such a way as to prevent them from being crushed, while economizing space and maintaining a single series, is recognized by every mycological curator. In many herbaria, it is still the practise to press all specimens flat and glue them to the sheet or enclose them in packets; in others, a separate box collection is kept for the larger specimens, and, when a specimen is wanted, there is much confusion and noise before it is found and finally returned to its proper place in the sequence. At the New York Botanical Garden, several devices have been tried with more or less success, the chief objects being to preserve the specimens and to arrange them, with all notes and drawings, in one series.

For large specimens, boxes of different sizes are used, and these are placed in light trays made of tulip wood, or glued to cardboard cut to fit the pigeonholes of the herbarium cases.

Small specimens are placed in pill-boxes or similar thin boxes specially designed, which are enclosed in packets, a safer and better way than fastening them directly to the sheet. A very convenient arrangement for special or odd sizes is a small open box with cardboard bottom and sides of cypress or white pine or cork strips attached with glue, which box is enclosed in a packet. This device is excellent for microscopic slides, which also properly belong in the herbarium series with the specimens.

The older mycologists mounted their specimens so that they might readily be seen as the sheets were turned, a method with obvious advantages, but, unfortunately, very destructive to the specimens. A rather expensive substitute for this method is the use of envelopes with transparent fronts and boxes with glass or celluloid tops, which might at least be employed for sample sets of species to be used for ready reference in the identification of new material.

All specimens, however mounted, should be inspected at least once a year, and a small quantity of naphthalene flake added to the boxes or packets in which they are kept in order to prevent invasion by insects. Suggestions from other curators will be welcomed.

Dr. N. L. Britton exhibited a number of plants recently collected in Cuba.

FRED J. SEAVER.

A COLLECTION OF JAPANESE CHERRY TREES.

In April, 1910, Mrs. Florence Lydig Sturgis offered to present the Garden with a collection of Japanese Cherry Trees, and the Board of Managers, at a meeting held April 18, 1910, authorized the Director-in-Chief to gratefully accept this gift.

A site for this plantation was selected last summer in a valley in the arboretum, contiguous to the collection of other kinds of cherry trees, and the ground was prepared for the plantation during the autumn. The path system of the arboretum planned for this part of the grounds was partly built during the fall and winter and completed early this spring. We were fortunate to

find twenty trees of eleven different types in the nurseries of the Hinode Nursery Company, at Whitestone, Long Island. These trees were well grown, averaging ten or twelve feet high, and were in excellent condition. Their location in this easily accessible nursery made obtaining them a simple matter, and early in April teams were sent to Whitestone, accompanied by our own gardeners, the trees were carefully dug out and were set in their new home within forty-eight hours after being taken from the nursery. At the present writing, they are in bloom and objects of great beauty.

NOTES, NEWS AND COMMENT.

Professor William Trelease, director of the Missouri Botanical Garden, visited the Garden on April 24 and 25 to examine the herbarium and collection of living plants.

Professor W. A. Setchell, of the University of California, visited the Garden on April 15 and again on May 2, to examine the collections of marine algae. He sailed for Europe on May 3.

Dr. LeRoy Andrews, of Cornell University, had been awarded a research scholarship at the Garden for the month of July.

Dr. Pehr Olsson-Seffer, professor of botany in the newly established University of Mexico and chief of the section of botany of the department of biological exploration of Mexico, was shot and killed by insurrectos on April 29 near Cuernavaca, about 75 miles from Mexico City. Dr. Olsson-Seffer had often visited the Garden and at the time of his death was sending portions of the herbarium of the Department of Agriculture of Mexico to the Garden specialists for study and determination. In January, 1909, he established "The American Review of Tropical Agriculture," which promised much in the way of advancing scientific agriculture in the tropics. Dr. Olsson-Seffer was a native of Finland, but he received his doctorate from Stanford University, where he was instructor in systematic botany from 1903 to 1905.

There are many interesting things to be seen now in conservatory range no. 1. One of these, in house no. 4 on one of the central

columns, is a large plant, a native of Costa Rica. This is *Solanum Wendlandii*, or Wendland's *Solanum*. At the top of this vine, near the glass, are the large clusters of flowers, resembling in color those of the common potato, of which it is a relative, for the potato is also a member of the same genus, being known as *Solanum tuberosum*. In passing to the next house, no. 5, note the large plant of *Medinilla magnifica*, to which attention was called some time ago, and which is still in full bloom, an object of great beauty. In house no. 5 is a plant of the rat-tail cactus, *Aporocactus flagelliformis*, from Mexico. Opposite this, on the west bench, the gasterias and aloes make a great show with their masses of flowers, ranging in color from white to red. In the next house, no. 6, is one of the century plants, sending up its tall flowering stem some twelve feet. This is *Agave univittata*, and belongs to the group of these plants with long spike-like inflorescence. In house no. 13 are two Australian plants. One of these is *Doryanthes excelsa*, rarely seen in flower, belonging to the amaryllis family. The flower-stalk is about twelve feet high, covered with sharp reflexed bracts, and bearing at the apex a large cluster of crimson flowers. The other Australian plant is the bottle-brush plant, *Callistemon citrinus*, with the red flowers borne in cylindric masses much resembling the common bottle-brush, hence the common name.

Meteorology for April.—The total precipitation for the month was 3.15 inches. Maximum temperatures were recorded of 69° on the 6th, 60° on the 10th and 15th, 61° on the 21st and 85° on the 29th. Also minimum temperatures were recorded of 24° on the 2d, 29° on the 12th, 31° on the 18th and 37.5° on the 27th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

4 specimens of mosses from North Carolina. (By exchange with the United States National Museum.)

1 specimen of *Juglans rupestris* from Texas. (Given by Mr. F. T. Ramsey.)

24 specimens of *Syrrhopodon* from South America. (By exchange with Dr. Harold Lindberg.)

4 specimens of *Syrrhopodon* from South America. (By exchange with Mr. Jules Cardot.)

1 specimen of *Chaptalia tomentosa* from South Carolina. (Given by Professor W. C. Coker.)

1 specimen of *Suaeda Richii* from Maine. (By exchange with the Herbarium of Harvard University.)

50 specimens "South Pacific Algae," from New Zealand and Tahiti. (Distributed by Miss Josephine E. Tilden.)

25 specimens of flowering plants from Porto Rico. (By exchange with Mr. E. D. W. Holway.)

2 specimens of *Carex* from Ohio. (By exchange with Mrs. Katharine D. Sharp.)

76 specimens from western Asia. (By exchange with the Bureau of Plant Industry, Washington, D. C.)

5 specimens of various hickory nuts. (Given by Dr. R. T. Morris.)

2 specimens of drugs. (Given by Dr. H. H. Rusby.)

5 miscellaneous museum specimens. (Given by Mrs. Alice C. Russell.)

PLANTS AND SEEDS.

6 Japanese cherry trees. (Purchased.)

418 shrubs and herbaceous plants for decorative collections. (Purchased.)

20 Japanese cherry trees. (Given by Mrs. Florence L. Sturgis.)

1 plant of *Hoffmannia Ghiesbreghtii variegata*. (By exchange with Department of Parks, Borough of Bronx.)

350 bulbs for decorative collections. (Purchased.)

95 Australian plants. (Purchased.)

1 *Oncidium* from Cuba. (Given by Mr. F. S. Earle.)

357 plants from Cuba. (Collected by Dr. & Mrs. Britton and Mr. J. F. Cowell.)

15 plants for conservatories from Cuba. (Collected by Dr. J. A. Shafer.)

1 *Epidendrum* from the Bahamas. (Collected by Dr. C. F. Millspaugh.)

8 plants for the Conservatories. (By exchange with Mr. Frank Weinberg.)

5 plants of *Populus*. (By exchange with Bureau of Plant Industry.)

1 plant of *Dendrobium nobile* var. Mrs. A. Rogers. (By exchange with Mr. H. Gernhart.)

4 orange trees. (Given by Col. F. A. Schilling.)

1,130 plants derived from seeds from various sources.

319 packets of seeds. (By exchange with Imperial Botanic Garden, St. Petersburg, Russia.)

67 packets of seeds. (By exchange with Botanic Garden, Imperial University, Sapporo, Japan.)

65 packets of seeds. (By exchange with Tiflis Botanic Garden, Russia.)

1 packet of seed. (By exchange with Mr. Carlo Zeimet.)

299 packets of seeds. (By exchange with Botanic Garden, Budapest, Hungary.)

1 packet of seed of *Ficus*, from Cuba. (Collected by Dr. N. L. Britton.)

4 packets of seeds. (Given by Peter Henderson & Co.)

88 packets of seeds. (By exchange with Botanic Garden, Frankfurt, Germany.)

96 packets of seeds. (By exchange with Botanic Garden, Strassburg, Germany.)

3 packets of seeds. (Given by Mr. Wilbur J. McNeil.)

6 packets of seeds from Costa Rica. (Given by Mr. C. Werckle.)

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[HOW, WILLIAM.] *Phytologia britannica, natales exhibens indigenarum stirpium sponte emergentium.* Londini, 1650.

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[KERNER, JOHANN SIMON.] *Flora stuttgardiensis, oder Verzeichniss der um Stuttgardt wildwachsenden Pflanzen.* Stuttgart, 1786.

KLATT, FRIEDRICH WILHELM. *Cryptogamenflora von Hamburg. Erster Theil. Schafthalme, Farrn, Bärlappgewächse, Wurzelfrüchtler, und Laubmoose.* Hamburg, 1868.

KLINGE, JOHANNES CHRISTOPH. *Revision der Orchis cordigera Fries und Orchis angustifolia Rohrb.* Jurjew, 1893.

KNAPP, JOHN LEONARD. *Gramina britannica, or representations of the British grasses.* London, 1804.

KNOOP, JOHANN HERMANN. *Beschryving en afbeeldingen van de beste soorten van appelen en peeren.* Amsterdam, 1790.

JOURNAL

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The New York Botanical Garden

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STUDENTS AND INVESTIGATORS AT THE NEW YORK BOTANICAL GARDEN, 1897–1911.

Abrams, LeRoy, Stanford Univ, Calif. Sheffield, Iowa, Oct. 1, 74. A.B, Stanford Univ, 99; A.M, 02; fellow, Columbia Univ. and N. Y. BOT. GARDEN, 04–05; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 05, 10. Act. prof. bot, Idaho Univ, 99–00; asst. systematic bot. Stanford Univ, 00–02; instr, 02–04; asst. curator, Div. Plants, U. S. Nat. Mus, 05; asst. prof. bot., Stanford Univ, 06–; *assoc. prof. 10–*. A.A.A.S; Nat. Geogr. Soc; Wash. Bot. Soc; Wash. Biol. Soc; Torrey Bot. Club. Taxonomy, phytogeography.

Anderson, Mary Perle, Horace Mann School, N. Y. City and East Berkshire, Vermont. East Berkshire, Vermont, June 9, 64. B.S, Mt. Holyoke Coll, 90; Mass. Inst. Tech, 97–98; Woods Hole, 99; Chicago Univ, 02–04; Columbia Univ. and N. Y. BOT. GARDEN, 06–08; Kew and Jardin des Plantes (Paris), 07. Teacher sci, Kansas City Ladies Coll, Independence, Mo, 90–94; teacher sci, Plymouth H. S, Mass, 94–95; instr. biol, Somerville H. S, Mass, 95–02; instr. nat. study, Vermont State Univ, summer schools, 02, 04, 05; instr. biol. and nat. study, summer session, Columbia Univ, 03; instr. bot, Mt. Holyoke Coll, Mass, 04–06; *critic teacher, biol. and nat. study, Teachers Coll, Columbia Univ, 07–*. First Stokes prize essay, Wild Flower Pres. Soc. Am, 04, 09; Am. Nat. Study Soc. Synopsis and geographical distribution of the ferns of Japan.

Andrews, Albert LeRoy, Cornell Univ, Ithaca, N. Y. Williamstown, Mass, Dec. 27, 78. A.B, Williams Coll, Williamstown,

Mass, 99; A.M, Harvard Univ, 03; Ph.D, Kiel Univ, 08; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 09. Instr. in German, Univ. of W. Virginia, 03–04; instr. in German, Dartmouth Coll, 04–05; *instr. in German, Cornell Univ, 08–*. Taxonomy of bryophytes.

Arthur, Joseph Charles, Lafayette, Ind. Lowville, N. Y, Jan. 11, 50. B.S, Iowa State Coll, 72; M.S, 77; Johns Hopkins Univ, 78–79; Harvard Univ, 79; Sc.D, Cornell Univ, 86; Bonn, 96; N. Y. BOT. GARDEN, 03, 04; RESEARCH SCHOLAR, 06, 07, 08. Instr. bot, Univ. of Minn. and Wisc, 79–82; bot. exp. station, Geneva, N. Y, 84–87; *prof. veg. physiol. and path, Purdue Univ, 87–; bot. Purdue Univ. Agric. Exp. Station, 88–;* Int. Cong. Arts and Sci, St. Louis, 04 (speaker); Int. Bot. Cong, Vienne, 05; Brussels, 10 (del. Smith Inst.). F. A. A. A. S. (secy. sec. F, 86; asst. gen. secy, 87; v. pres, 95); Bot. Soc. Am. (pres. 02); Soc. Prom. Agric. Sci; fellow, Ind. Acad. Sci. (pres. 93); Iowa Acad. Sci; Wash. Acad. Sci; Phila. Acad. Sci; Torrey Bot. Club; Int. Assoc. Bot; Deutsch Bot. Ges. Mycology; fungous diseases of cultivated plants, development of plant rusts.

Bailey, Harriet Brown, deceased, Nov. 25, 05. N. Y. BOT. GARDEN, 02–04. Wild Flower Pres. Soc. Am.

Baker, Charles Fuller, Pomona Coll, Claremont, Calif. Lansing Mich, March 22, 72. B.S, Mich. Agric. Coll, 92; A.M, Stanford Univ, 03; N. Y. BOT. GARDEN, 06. Asst. zool, Mich. Agric. Coll, 91–92; asst. zool. and entom, Colorado Agric. Coll, 92–97; zoologist, Ala. Polytech. Inst. and entom. to exp. station, 97–99; teacher biol, Central H. S, St. Louis, 99–01; asst. prof. biol, Pomona Coll, 03–04; chief dept. bot. Estacion Central Agron. de Cuba, 04–07; curator, herbarium and Bot. Garden, Museu Goeldi, Para, Brazil, 07–08; assoc. prof. biol. Pomona Coll, 08–09; *prof. zool, 09–;* zoologist and assoc. botanist, Ala. biol. surv; in charge, Colorado forestry and zool. expl. exped. in Santa Marta Mts, Colombia, 98–99; F. A. A. A S; Assoc. Econom. Entom; Entom. Soc; S. Calif. Acad. Sci. Wash. Entom. Soc; Havana Acad. Entomology; botany.

Banker, Howard James, DePauw Univ, Greencastle, Ind. Schaghticoke, N. Y, April 19, 66. A.B, Syracuse Univ, 92;

M.A, Columbia Univ, 00; Ph.D, 06; N. Y. BOT. GARDEN, 99–00, 02, 03–04, 05, 06, 10. Instr. biol. S. West Nor. School, California, Pa, 01–04; *prof. biol. De Pauw Univ, 04–*. F. A. A. A. S; Bot. Soc. Am; Torrey Bot. Club; Sullivant Moss Soc; Ind. Acad. Sci. Mycology, taxonomy of Hydnaceae.

Banta, May. B.S, Wellesley Coll, 89; N. Y. BOT. GARDEN, 99–00.

Barnhart, John Hendley, 2690 Morris Ave, N. Y. City. Brooklyn, N. Y, Oct. 4, 71. A.B, Wesleyan Univ, 92; A.M, 93; M.D, Columbia Univ, 96; N. Y. BOT. GARDEN, 01–03; Int. Bot. Cong, Vienna, 05 (del. N. Y. Bot. Garden); Int. Cong, Brussels, 10 (del. N. Y. Bot. Garden and Torrey Bot. Club). *Editorial asst. N. Y. Bot. Garden, 03–; librarian, 07–.* F. A. A. A. S; Am. Soc. Nat; Torrey Bot. Club (editor-in-chief, 03–07, *v. pres, 08–*); N. Y. Bot. Garden (life mem.); Biol. Soc. Wash. Botanical bibliography and nomenclature; taxonomy of flowering plants; local floras of North America.

Barrett, Alice Irene, deceased. N. Y. BOT. GARDEN, 00 01.

Barrett, Mary Franklin, 19 Elm St, Bloomfield, N. Jersey. Bloomfield, N. J, Aug. 25, 79. B.L, Smith Coll, 01; Barnard Coll, Columbia Univ, 01–02; Woods Hole, 02; Columbia Univ. and N. Y. BOT. GARDEN, 03, 06, 09–10; A.M, Columbia Univ, 05; Cornell Univ, summer, 06. Teacher, H. S, Verona, N. Jersey, 04; teacher sci. and math, Randolph-Pond School, N. Y. City, 05–06; instr. bot, Wellesley Coll, 06–08; *assoc. instr. nat. study, State Normal School, Upper Montclair, N. J, 08–.* Nature study; taxonomy of fungi.

Bateson, Charles Edward Wagstaffe, E.M, Columbia Univ, 02; A.M, 05; N. Y. BOT. GARDEN, 04–05. Paleobotany.

Benedict, Ralph Curtiss, N. Y. Bot. Garden, N. Y. City. Syracuse, N. Y, June 14, 83. Ph.B, Syracuse Univ, 06; Ph.D. Columbia Univ, 11; STUDENT AND AID, N. Y. BOT. GARDEN, 06–08; ASST. CURATOR, Je, 09; RESEARCH SCHOLAR, 10, 11; scholar, Columbia Univ, 08–09; fellow, 09–10. Inst. in bot. N. Y. Univ. (summer school) 10, 11; *lecturer in bot, Fordham Univ. Medical School, 10–; instr. bot. N. Y. Univ, Coll. Div. and bacter, School of Appl. Sci, 11–.* F. A. A. A. S;

Am. Fern. Soc; *assoc. editor, Am. Fern. Jour*, 10–. Morphology and phylogeny of ferns, dendrology.

Billings, Elizabeth, 279 Madison Ave, N. Y. City. Woodstock, Vermont, 71. Barnard Coll. (special student), 95; N. Y. Bot. Garden, 02–03, 04, 05, 06, 08. N. Y. Acad. Sci. (life mem.); Paleobotany, taxonomy.

Blodgett, Frederick Harvey, Roanoke Coll, Virginia. Rockford Ill, Sept. 12, 72. B.S, Rutgers Coll, 97; M.S, 99; student and aid, N. Y. Bot. Garden, 00–01; asst. curator bot, Field Columbian Mus, 01; asst. State Path, Maryland Agric. Coll, 01–06; grad. student asst. bot, Johns Hopkins Univ, 06–10. F. A. A. A. S; Torrey Bot. Club; N. J. Micr. Soc. Pathology; embryology and ontogeny.

Bower, Frederick Orpen, Univ. of Glasgow, Glasgow, Scotland. Ripon, Yorkshire, England, Nov. 4, 55. B.A, Univ. of Cambridge, 77; also M.A. and Sc.D; studied at Strassburg; Kew; Peradeniya; Glasgow; N. Y. Bot. Garden, (Cinchona) summer, 09. Prof. Univ. Coll, London, 80–82; Royal Coll. of Sci, S. Kensington, 82–85; *Univ. of Glasgow, 85–.* Fellow of the Royal Soc. London; Royal Soc. Edinburg; Fellow of Linnean Soc. of London; Deutsch Bot. Ges; Bavarian Acad. Wiss. Morphology.

Brackett, Mary Morrell, Morris H. S, N. Y. City. A.B, N. Y. City Normal Coll. 93; A.B, Barnard Coll, Columbia Univ, 99; Cold Spring Harbor, 01, 02, 03; N. Y. Bot. Garden (Cinchona) 04. Sec'y Wadleigh H. S, N. Y. City, 00–09; *teacher biol, Morris H. S, N. Y. City, 09–.* A. A. A. S, Torrey Bot. Club, N. Y. Assoc. Biol. Teachers, Asst. editor Plant World, 06–07. Morphology, physiology.

Braislin, Anna Priscilla. (Mrs. Thomas H. Montgomery, Jr.) A.B, Vassar Coll, 97; Univ. of Penn, Philadelphia; N. Y. Bot. Garden, 99–00.

Brandenburg, Ellen Klapp. Philadelphia, Pa, 82. B.S, Columbian Univ, 04; Harvard Univ, summer school, 03; Cold Spring Harbor, 05; Cornell Univ, summer school, 06; N. Y. Bot. Garden, 07. *Instr. biol. and English, Washington H. Schools, 04–07.* Botany, mycology.

Bray, William L, Syracuse Univ, Syracuse, N. Y. Burnside, Ill, Sept. 19, 65. Cornell Univ, 89–91; A.B, Indiana State Univ, 93; M.A, Lake Forest, 93–95; M.A, 94; Univ. of Berlin, 96–97; Ph.D, Univ. of Chicago, 98; N. Y. BOT. GARDEN 06. Inst. in bot, Lake Forest, 94–95; adj. prof. biol, 96; inst. bot, Univ. of Texas, 97–98; adj. prof, 98–01; assoc. prof, 02–05; prof. 05–07; *prof. bot, Syracuse Univ, 07–*. F. A. A. A. S; Bot. Soc. Am; Int. Assoc. Bot; Phi Beta Kappa; Sigma Xi. Ecology.

Broadhurst, Jean, Teachers Coll, Columbia Univ, N. Y. City. Stockton, N. J, Dec. 29, 73. N. J. State Nor. School, Trenton, N. J, 92; B. S, Teachers Coll, Columbia Univ, 03; A.M, 08; N. Y. BOT. GARDEN, 01–02. Asst. bot. Barnard Coll, 02–03; inst. biol. and nat. study, N. J. State Nor. School, 03–06; *instr. biol. Teachers Coll, 06–*. F. A. A. A. S; Torrey Bot. Club; Wild Flower Pres. Soc. Am. (2d Stokes prize essay, 04); Nat. Study Soc; editor, Torreya, 08–11; *assoc. editor Jour. Torrey Bot. Club, 11–*. Morphology.

Broomall, Laura Baker. B.S, Univ. of Mich, 98; N. Y. BOT. GARDEN, 03. Embryology of spermatophytes.

Britton, Elizabeth Gertrude, N. Y. Bot. Garden, Bronx, N. Y. City. N. Y. City, Jan. 9, 58. Private schools, Matanzas, Cuba to 69; private school 6, East 42 St, 69–73; grad. Normal Coll, 75; N. Y. BOT. GARDEN 99–. Critic teacher, Training Dept, Normal Coll, 75–82; asst. in nat. sci, 82–85. Torrey Bot. Club; Sullivan Moss Soc; Conn. Bot. Soc; Bot. Soc. Am; Am. Fern Soc. Morphology, taxonomy of bryophytes.

Bruckman, Louisa, 103 W. 87 St, N. Y. City. New York, March 16, 72. N. Y. City Normal Coll, 87–91; Pd.B, 95; Pd.M, N. Y. Univ, 95; B.S, 07; Cornell Univ, summer school, 99; Cold Spring Harbor, 00, 01, 03; N. Y. BOT. GARDEN, 00–01. Teacher, elementary schools of N. Y. City, 92–02; *instr. biol. Girls' H. S, Brooklyn, 02–*. Torrey Bot. Club; N. Y. Assoc. of Biology Teachers. Biology.

Brues, Charles Thomas, Bussey Inst, Forest Hills, Boston, Mass. Wheeling, W. Virginia, June 20, 79. B.D, Univ. of Texas, 01; M.S, 02; N. Y. BOT. GARDEN, 02–03; scholar in zool, Columbia Univ, 03–04. Special field agent, U. S. Dept. of Agric., 04–05;

member of staff, Marine Biol. Lab, Woods Hole, 03; curator invert. zool, Milwaukee Pub. Mus, 05–09; *inst. econom. entom, Harvard Univ, 09–*. Wisconsin Nat. His. Soc. (gen. secy, and editor, Quarterly Bull, 06–09); A. A. A. S; Assoc. Econom. Entom; Entom. Soc. Am; Wisc. Acad. Sci, Arts and Letters; Cambridge Entom. Club; *editor of Psyche, 10–*. Taxonomy and ecology of Gramineae.

Budington, Robert Allyn, Oberlin Coll, Oberlin, Ohio. Leyden, Mass, Oct. 22, 73. A.B, Williams Coll, Mass, 96; A.M, 99; Columbia Univ, 99–02; N. Y. Bot. Garden. Instr. in math. and sci, Dow Acad, Franconia; asst. in biol, Williams Coll, Mass, 98–99; asst. demonstrator of physiol, Columbia Univ, 00–02; instr. in zoology and physiol, Mt. Hermon School, 02–05; instr. in biol, Wesleyan Univ, 05–08; *assoc. prof. zoology, Oberlin Coll, Ohio, 08–*. F. A. A. A. S; Am. Soc. of Zoologists (Eastern branch); Am. Soc. Naturalists; Ohio Acad. Sci. Botany, zoology.

Burlingham, Gertrude Simmons, Eastern District H. S, Brooklyn, N. Y. Mexico, N. Y, April 21, 72. A.B, Syracuse Univ, 96; Woods Hole, 99; N. Y. Bot. Garden and Columbia Univ, 05–08; Ph.D, 08. Preceptress, Ovid Union School, N. Y, 96–98; teacher biol. sci, Binghamton H. S, N. Y, 98–05; instr. biol, N. J. State Nor. School, Trenton, N. J, Mar.–June, 08 ; *teacher biol, Eastern District H. S, Brooklyn, N. Y, 09–*. Torrey Bot. Club; Brooklyn Inst. Arts and Sci. Biology; mycology, taxonomy of Agaricaceae; plant physiology.

Butler, Bertram Theodore, College of the City of New York, N. Y. City. Nashua, Iowa, Mar. 22, 72. Ph.B, Hamline Univ, Minn, 01; A.M, Columbia Univ, 08; Columbia Univ. and N. Y. Bot. Garden, 07–. Teacher, elementary schools and H. S, 90–98; instr. nat. sci, Montana Wesleyan Univ, 03–05; City Supt. of Schools, Glendive, Mont, 05–07; *teacher of botany, Coll. of the City of N. Y, 09–; botanist with the Intercontinental Rubber Co, N. Y. City.* Flora of Montana; rubber producing plants.

Byrnes, Esther Fussell, Girls' H. S., Brooklyn, N. Y. City. Philadelphia, Pa, Nov. 3, 67. A.B, Bryn Mawr, 91; A.M,

94; fellow, 94–95; Ph.D, 98; Woods Hole, 91; N. Y. Bot. Garden, 02–03. Demonstr. biol, Vassar Coll, 91–93; Bryn Mawr, 95–97; *teacher biol, Girls H. S, Brooklyn, 98–*. Am. Soc. Nat; Mar. Biol. Assoc; fellow, N. Y. Acad. Sci; N. Y. Assoc. Biol. Teachers (v. pres). Cytology; zoology, experimental morphology.

Cannon, Getrude Louise, 1786 Clay Avenue, New York City. N. Y. City, July 9, 86. A.B, Barnard Coll, Columbia Univ, 07; Teachers Coll, 07–08; A.M, Columbia Univ, 09; N. Y. Bot. Garden, summer, 10. Research worker (as special attendant on staff of Long Island State Hospital) research in hereditary transmission of insanity, epilepsy, etc, Mar. 19 to Sept. 3, 10. Morphology and taxonomy of bryophytes and fungi.

Cannon, William Austin, Tucson, Arizona. Washington, Mich, Sept. 23, 70. A.B, Stanford Univ, 99; A.M, 00; fellow, Columbia Univ, 00–02; Ph.D, 02. Asst. bot. Stanford Univ, 99–00; lab. asst. N. Y. Bot. Garden, 02–03; Carnegie fellow, 06; resident investigator, Desert Bot. Lab, Carnegie Inst, Tucson, Ariz, 03–05; *member of staff, 05–*. F. A. A. A. S; Bot. Soc. Am; Nat. Geog. Soc; Am. Forestry Assoc. Structure of plant hybrids; biology of desert plants.

Cardiff, Ira Dietrich, Washburn Coll, Topeka Kansas. Goshen, Ill, June 20, 73. B.S, Knox Coll, Ill, 97; Chicago Univ, 99–04; Ph.D, Columbia Univ, 06; N. Y. Bot. Garden, 04–06; Asst. Bot. Columbia Univ, 04–06; asst. prof. bot, Univ. of Utah, 06–07; prof, 07–08; *prof. bot. Washburn Coll, 08–*. A. A. A. S; Kans. Acad; Utah Acad; Nat. Geogr. Soc. Morphology, cytology.

Carss, Elizabeth. Ph.B, Cornell Univ, 95; N. Y. Bot. Garden, 00–01.

Chedsey, Mary Coe (Mrs. H. Mack Thomas), White Plains, N. Y. N. Y. City, 79. A.B, N. Y. City, Nor. School, 98; B. S, Teachers Coll, Columbia Univ, 04; Barnard Coll; N. Y. Bot. Garden; Woods Hole, summer, 03; Cold Spring Harbor, 05. Teacher, N. Y. City elem. schools, 98–02; teacher of sci, Charlton School, N. Y. City, 04–05; substitute teacher, N. Y.

Training School for Teachers, 06. Torrey Bot. Club; Am. Nat. Study Soc.

Clark, Anna May, Training School for Teachers, 212 W. 120th St, N. Y. City. Brookfield, Vermont, April 21, 74. State Nor. School, New Britain, Conn, 96; Ph.B, Vermont Univ, 97; master's diploma, Teachers Coll, Columbia Univ, 04; M.A, 04; N. Y. Bot. Garden, 03–04. Teacher sci, State Nor. School, Farmington, Mass, 99–03; teacher sci. and nat. study, N. Y. City Training School for Teachers 04–07; *first asst. and head dept, 07–*. Biology, botany, nature study.

Clark, Ernest Dunbar, Dept. Biol. Chem, Columbia Univ, N. Y. City. Boston, Mass, May 4, 86. John Harvard scholar, 06–07; research asst. to Dr. Alsberg, dept. physiol. chem, Harvard Univ. medical school, 07–08; A.B. (in chemistry), 08; fellow, physiol. chem, Columbia Univ, 09–10; A.M, 09; Ph.D, 10; Columbia Univ. and N. Y. Bot. Garden, *08–*. Asst. chem, Harvard Univ, 07–08; *instr. biol. chem, Columbia Univ, 10–*. A. A. A. S; Am. Chem. Soc; N. Y. Acad. Sci; Assoc. Harvard Chemists; Torrey Bot. Club; Columbia Biochemical Assoc. Problems in plant chemistry.

Clements, Frederic Edward, Univ. of Minn, Minneapolis, Minn. Lincoln, Nebr, Sept. 16, 74. B.S, Univ. of Nebr, 94; A.M, 96; Ph.D, 98; N. Y. Bot. Garden, 02. Asst. bot. Univ. of Nebr, 94–97; instr, 97–01; adj. prof, 01–03; asst. prof, 03–05; assoc. prof. plant physiol, 05–06; prof, 06–07; *prof. bot, Univ. of Minn, 07–*. F. A. A. A. S; Bot. Soc. Am. Phytoecology; mycology.

Clements, Mrs. F. E. (See Scawartz, Edith.)

Coker, William Chambers, Univ. of N. Carolina, Chapel Hill, N. C. Hartsville, S. Carolina, Oct. 24, 72. B. S, Univ. of S. Carolina, 94; Ph.D, Johns Hopkins Univ, 01; Bonn, 01–02; N. Y. Bot. Garden (Cinchona), summer, 00, 05, 07, 09, 10. Asst. bot, Cold Spring Harbor, 00; assoc. prof. bot. Univ. of N. Carolina, 02–08; *prof, 08–;* chief of bot. staff, Bahama exped. of Baltimore Geogr. Soc. 03. F. A. A. A. S; Am. Soc. Nat; Bot. Soc. Am; N. Carolina Acad. Sci. (v. pres, 07–10, *pres. 10–*); *editor Jour. of Elisha Mitchell Sci. Soc.* Cytology, embryology.

Cook, Melville Thurston, Agric. Exp. Station, Newark, Delaware. Coffeen, Ill, Sept. 20, 69. DePauw Univ, Ind, 88–89, 91–93; A.B, Stanford Univ, 94; A.M, DePauw Univ, 01; fellow, Ohio State Univ, 01–02; Ph.D, 04; Woods Hole, 96, 99, 00; Univ. of Chicago, summer, 97, 98; summer lab, Sandusky, Ohio, 02–03; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 07. Principal, H. S, Vandalia, Ill, 94–95; instr. biol, DePauw Univ, 95–97; prof, 97–04; lecturer human embryol, Central Coll. Physicians and Surgeons, Indianapolis, Ind, 02–03; comp. anat, Medical Coll, Ind, 03–04; chief dept. plant path. and econom. entom, Estacion Central Agron. de Cuba, Santiago de las Vegas, Cuba, 04–07; *prof. bot, Delaware Coll, and plant path, exp. station, 07–.* F. A. A. A. S; Assoc. Econom. Entom; fellow, Ind. Acad. Sci; Bot. Soc. Am; Phytopath. Soc; Entom. Soc. Am. Pathology, resistance or immunity to disease; cecidology.

Corry, Robert Thomas, Coll. Physicians & Surgeons, Columbia Univ, N. Y. City, Jan. 26, 89. Coll. of the City of N. Y, 06–09; *Coll. of Physicians and Surgeons, 09–.* Physiological chemistry of plants, toxins of bacteria and fungi.

Crane, Aurelia Blair, Barnard Coll; N. Y. BOT. GARDEN, 04–05. Torrey Bot. Club. Mycology.

Cummings, Clara Eaton, deceased, Dec. 28, 06. Plymouth, N. H, July 13, 55. Wellesley Coll, 76–79; Zurich, 86–87; N. Y. BOT. GARDEN (CINCHONA), 05. Instr. bot. Wellesley Coll, 79–87; assoc. prof, 87–03; prof. 03–06. Chief editor, "Decades of N. A. Lichens" and "Lichenes Boreali"; assoc. editor Plant World, 05–06; F. A. A. A. S; Soc. Plant Morphol. and Physiol. (v. pres, 04); Mycol. Soc; Torrey Bot. Club; Bost. Soc. Nat. Hist; Bost. Mycol. Club; Wild Flower Pres. Soc. Am. Lichenology.

Darling, Chester Arthur, Columbia Univ, N. Y. City. Leon, N. Y, Oct. 4, 80. A.B, Albion Coll, 04; A.M, 06; Ph.D, Columbia Univ, 09; Columbia Univ. and N. Y. BOT. GARDEN, 06–. Prof. biol, Defiance Coll, Defiance, O, 04–06; asst. bot, Columbia Univ, 06–08; tutor bot, 08–10; *instr. bot. 10–.* Torrey Bot. Club. Cytology, morphology.

Delafield, Mrs. John Ross (See White, Violette S.).

Derickson, Samuel Hoffman, Lebanon Valley Coll, Annville, Pa. Grad. Lebanon Valley Acad, 98; B.S, Lebanon Valley Coll, 02; M.S, 03; *Johns Hopkins Univ, 03–;* Bahama Islands, June & July, 03; Bermuda Islands, 09; N. Y. BOT. GARDEN (CINCHONA), 10; Cold Spring harbor, 10. Act. prof. biol, Lebanon Valley Coll, 04–06; *prof. biol, 07–*. Morphology and taxonomy of Hepaticae, taxonomy of various groups of plants.

Dodge, Bernerd Ogilvie, Columbia Univ, N. Y. City. Mauston, Wisconsin, April 18, 72. Grad. Milwaukee Nor. School, 01; Univ. of Wisconsin, various times, 95–08; Ph.B, 08; *asst. bot. Columbia Univ, and* N. Y. BOT. GARDEN, 08–. Principal, Greenwood High School, Greenwood, Wisc, 96–00; Algoma High School, 01–07. Torrey Bot. Club (*secy. & treasurer 11–*). Mycology, morphology and taxonomy of Ascobolaceae.

Dow, Bertha McLane, 123 W. 80 St, N. Y. City. New York City, June 3, 69. Barnard Coll. (spec. student), 95, 01–02; N. Y. BOT. GARDEN, 00–01; Woods Hole, summer, 06; *Teachers Coll, Columbia Univ, 10–*. Instr. sci, Park Ave. School, N. Y. City, 01–05; *instr. sci, The Alcuin Prep. School, N. Y. City, 05–*. Biology.

Dufour, Alice. Gallipolis, Ohio, Aug. 22, 63. Ohio State Univ, 97–99; A. B, Defiance Coll, O, 99; fellow and asst. bot, Ohio State Univ, 99–00; N. Y. BOT. GARDEN, 00–01, 02–03; A.M, Columbia Univ, 03; directora, Escula Practica de senoritas, Guatemala City, Cent. Am, 05–07; principal Stockbridge Hall, Yarmouth, Me, 07. Sociology; botany.

Dunn, Louise Brisbane, deceased, Dec. 18, 02. A.B, Columbia Univ, 97; A.M, 99; N. Y. BOT. GARDEN, 99–00.

Durand, Elias Judah, Univ. of Missouri, Columbia, Mo. Canandaigua, N. Y, March 20, 70. A.B, Cornell Univ, 93; Sc.D, 95; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 05; asst. bot, Cornell Univ. and asst. crypt. bot, agric. exp. station, 95–96; instr. bot, 96–10; asst. curator herb, 98–00; *asst. prof. bot, Univ. of Missouri,* 10–; F. A. A. A. S.; Bot. Soc. Am; Sigma Xi. Mycology, discomycetes; embryology.

Eaton, Elon Howard, Hobart Coll, Geneva, N. Y. Springville, N. Y, Oct. 8, 66. Griffith Inst, 85; A.B, Univ. of Rochester, 90; A.M, 93; M.S, 10; Columbia Univ. and N. Y. BOT. GARDEN, 99–00; Woods Hole, 08. Asst. principal, Canandaigua H. S, 89 and teacher sci, 90–95; master of sci, The Bradstreet School, Rochester, N. Y, 95–06; *prof. biol, Hobart Coll, Geneva, N. Y,* 07–. F. A. A. A. S.; Am. Ornith. Union; fellow, Rochester Acad. Sci.; Forestry Assoc. Ornithology and botany, ecology and forestry.

Eggleston, Willard Webster, U. S. Dept. of Agric, Washington, D. C. or Rutland, Vt. Pittsfield, Vermont, March 28, 63. B.S, Dartmouth, 91; student, Gray Herbarium, 97; Biltmore Herb, 07–08; Harvard Univ, 03; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 08, 09, 10. Work on local flora of Vermont, 91–04; asst. city engineer, Rutland, Vt, 93–97; civil engineering, 97–04; AID, N. Y. BOT. GARDEN, 04–07; lecturer, Biltmore Forest School, 07–08; *Bur. Pl. Indust, U. S. Dept. Agric.* 10–. F. A. A. A. S. Vermont Bot. Club; N. Eng. Bot. Club; Thayer School Civil Engineers (Dartmouth); Wash, Bot. Club. Taxonomy of *Crataegus*, Pomaceae, *Delphinium*, poisonous plants.

Emerson, Julia Titus, 131 E. 66 St, N. Y. City. N. Y. City, April 6, 77. Coll. Pharm, Columbia Univ, 98; Teachers Coll, Columbia Univ, 98–99; Woods Hole, 99, 00, 01, 03, 04; Briarcliff Manor Agric. School, 01; N. Y. Bot. GARDEN, 02–04; 04–09. Spec. asst. plant path, Purdue Univ, 02; lab. asst, N. Y. BOT. GARDEN, 03–04; private tutor in bot. 06. Torrey Bot. Club; Wild Flower Pres. Soc. Am; National Conserv. Assoc. Taxonomy of mosses.

Evans, Helen, Ph.B, Syracuse Univ, Syracuse, N. Y, 01; N. Y. BOT. GARDEN, 06–07.

Fairman, Charles Edward, Lyndonville, N. Y. Yates, N. Y. Dec. 28, 56. A.B, Univ. of Rochester, 74; A.M, 77; M.D, St. Louis Medical School (Washington Univ.), 77; N. Y. BOT. GARDEN 10. Corresponding Mem. Rochester Acad. Sci. Mycology, taxonomy of ascomycetes.

Fawcett, Edna Hague. Washington, D. C, Feb. 26, 79. B.L, Smith Coll, 01; Barnard Coll, 02–03; N. Y. BOT. GARDEN, 04–

05; teacher, public schools, Springfield, Mass, 01–02; teacher, primary work and nat. study, Miss Keller's Day School, N. Y. City, 02–05; sci. asst, Bureau Pl. Industry (Lab. soil bac. and water purif. invest.), U. S. Dept. Agric, Washington, D. C, 06. Soil bacteriology.

Field, Ethel Content, U. S. Dept. of Agric, Washington, D. C. Conway, Mass. Scholar in bot, Univ. of Nebr, 08–09; A.B, 08; M.A, 09; N. Y. BOT. GARDEN, 10. Asst. bot, Univ. Nebr. 08–09; teacher bot. in School of Agric. to County Teachers, summer, 09. Phytopath. Soc; Sigma Xi. Phytopathology, physiology and taxonomy of fungi.

Gager, Charles Stuart, Brooklyn Botanic Garden, Brooklyn, N. Y. Norwich, N. Y, Dec. 23, 72. A.B, Syracuse Univ, 95; Pd.B. and Pd.M, N. Y. State Nor. Coll, 97; Harvard Univ, 97; Ph.D, Cornell Univ, 02. Lab. asst. biol, Syracuse Univ, 94-95; v. principal, Ives Sem, N. Y, 95–96; prof. biol. sci. and physiog, N. Y. State Nor. Coll, Albany, 97–05; asst. bot, Cornell Univ, summer, 01–02; instr. 05; collaborator, Jour. Applied Micros, 01–02; LAB. ASST, N. Y. BOT. GARDEN, 04–05; acting prof. bot. Rutgers, 05; prof. bot. N.Y. Univ, summer, 05, 06; teacher biol, Morris H. S, N. Y. City, 05; DIRECTOR OF THE LABORATORIES, N. Y. BOT. GARDEN, 06–08; prof. bot. State Univ, Missouri, 08–10; *director Brooklyn Botanic Garden*, 10–. Assoc. editor, Plant World, 05; F. A. A. A. S; fellow, Am. Geol. Soc, 05–06; N. Y. State Teachers Assoc, 01–04; Albany Entom. Soc. 98–04 (v. pres. 98–99); Torrey Bot. Club (secy, 05–08); Soc. Exp. Biol. & Med; Am. Soc. Biol. Chemists; Bot. Soc. Am.; St. Louis Acad. Sci, 08–10; Phi Beta Kappa; Sigma Xi. Plant physiology; cytology.

Gaines, Elizabeth Venable, 297 Ryerson St, Brooklyn, N. Y. Mossingford, Virginia, April 25, 69. Vassar Coll, 89; Mass. Inst. Tech, 92–94; Chicago Univ, 98; A.B, Adelphi Coll, 99; M.A, Columbia Univ, 03; N. Y. BOT. GARDEN, 02–03. *Instr. biol. Adelphi Coll*, 99–. Am. Home Econom. Assoc; N. Y. State Sci. Assoc. Sanitary biology.

Gardener, John Robert, 24 E. 99th St, N. Y. City. Fayette, Iowa, 70. B.S, Upper Iowa Univ, Fayette, Iowa, 90; C.E,

State Univ. of Iowa, 94; M.S, Upper Iowa Univ, 98. N. Y. Bot. Garden, 00, and various times thereafter. A. A. A. S; Math. Soc. Botany; mathematics.

Gilman, Charles Winthrop. N. Y. Bot. Garden, 00–01. Mosses.

Gleason, Henry Allen, Univ. of Michigan, Ann Arbor, Mich. Dalton City, Illinois, Jan. 2, 82. B.S, Univ. of Ill, 01; M.A, 04; fellow, Ohio State Univ, 04–05; Columbia Univ. and N. Y. Bot. Garden, 05–06; Ph.D, 06. Asst. bot. Univ. of Ill, 01–03; instr, 03–04, 06–09; assoc, 09–10; special asst, Missouri Bot. Garden, summer, 04; Univ. of Mich, Mus. expedition to Isle Royle, summer, 05; *asst. prof. bot, 09–*. F. A. A. A. S; Bot. Soc. Am; Torrey Bot. Club; Ill. Acad. Sci; Mich. Acad. Sci; National Geogr. Soc; Sigma Xi. Ecology and phytopathology with special reference to the prairie province and to post glacial migration.

Gordon, Clarence Everett, Mass. Agric. Coll, Amherst, Mass. Clinton, Mass, Feb. 15, 76. B.S, Boston Univ, 03; M. A, Columbia Univ, 05; Ph.D, 11; N. Y. Bot. Garden, 05–06. *Asst. prof. zool. and geol, Mass. Agric. Coll. 10–*. A. A. A. S; Am. Breeders Assoc; National Geogr. Soc; Assoc. N. Y. Acad. Sci. Geology and zoology.

Griffiths, David, U. S. Dept. Agric, Washington, D. C. Abaristwyth, Wales, Aug. 16, 67. B.S, S. Dakota Agric. Coll, 92; M.S, 93; Ph.D, Columbia Univ, 00; N. Y. Bot. Garden, 99–00. Teacher sci, Aberdeen H. S, Aberdeen, S. Dakota, 93–98; prof. bot. Ariz. Agric. Coll. and bot. Ariz. Agric. Exp. Station, 00–01; *asst. div. agrost, U. S. Dept. Agric, 01–*. F. A. A. A. S; Bot. Soc. Am; National Geogr. Soc; Bot. Soc. Washington; Washington Acad. Sci; Torrey Bot. Club. Forage plants.

Grout, Leon Everett. Newfane, Vermont, Sept. 14, 77. B.S, Univ. of Vermont, 02; Teachers Coll, Columbia Univ. and N. Y. Bot. Garden, 02–03. Agriculture.

Gruenberg, Benjamin C, 69 W. 88 St, N. Y. City. Czernowitz, Austria, Aug. 15, 75. B.S, Univ. of Minn, 96; N. Y. Univ. School of Pedagogy, 01–02; N. Y. Bot. Garden, 02–06; 07–09, 10–11; A.M, Columbia Univ, 04. Sugar testing lab, U. S.

Appraisers Stores, N. Y. City, 98–02; instr. De Witt Clinton H. S, 02–10; *head dept. biol, Commercial H. S, Brooklyn, N. Y,* 10–. Teacher evening schools of N. Y. City, 02–03, 04–07; lecturer biol, Rand School Social Sci, 07; A. A. A. S; N. Y. H. S. Teachers Assoc; N. Y. Assoc. Biol. Teachers. Mycorrhiza problem.

Hanks, Lena Tracy, 425 Nostrand Ave, Brooklyn, N. Y. New York, Jan. 1, 79. A.B, Columbia Univ, 01; A.M, 02; MUS. AID, N. Y. BOT. GARDEN, 01–02; Adelphi Coll, Brooklyn, 03–04. Teacher sci, Adelphi Acad, 03–04; *teacher biol. Girls' H. S.* 05–. Linaean Soc. Biology.

Hare, Raleigh Frederick, College of P. & S, Columbia Univ. B.S, Alabama Polytech. Inst, 92; M.S, 93. Columbia Univ. and N. Y. BOT. GARDEN, 10–. *Prof. chem, N. Mexico Agric. Coll. and chemist to the N. Mexico Exp. Station* (absent on leave). Plant chemistry.

Harlow, Sarah Havens, Nyack, N. Y. Florida, Orange County, N. Y, Oct. 20, 67. B.S, Wellesley, 91; N. Y. BOT. GARDEN, 99–01; A.M, Columbia Univ, 01. Teacher, Am. Collegiate Inst, Smyrna, Turkey, 93–96; Tuxedo Park School, Tuxedo Park, N. Y, 96–99; Randolph Cooley School, Plainfield, N. Jersey, 01–03; private tutor, Norfolk, Conn, 04–08; *private tutor, Nyack, N. Y,* 08–. Botany.

Harper, Roland McMillan, College Point, N. Y. Farmington, Me, Aug. 11, 78. B.E, Univ. of Georgia, 97; N. Y. BOT. GARDEN, 99–05; Ph.D, Columbia Univ, 05. Aid, U. S. Nat. Herb, 01, 02; collector, Geol. Surv. Ga, 03–04; MUS. AID, N. Y. BOT. GARDEN, 04; bot, Geol. Surv. Ala, 05, 06, 11; forestry asst. Am Mus. Nat. Hist, 06; lecturer bot. Biltmore Forest School, 08; collector in Fla. for Arnold Arboretum 09, 10. N. Eng. Bot. Club; Torrey Bot. Club; F. A. A. A. S. Phytogeography of Eastern North America, especially of the coastal plain.

Haynes, Caroline Coventry, Highlands, N. Jersey and 16 E. 36 St, N. Y. City. N. Y. City, April 13, 58. Grad. Mrs. Sylvanus Reed's School, 76; N. Y. BOT. GARDEN, 02–. Torrey Bot. Club; Sullivant Moss Chapter (v. pres, 08); Wild Flower

Pres. Soc. Am; N. Y. Bot. Garden (ann. memb.). Taxonomy of Hepaticae.

Hazen, Tracy Elliot, Barnard Coll, Columbia Univ, N. Y. City. Jericho Center, Vermont, July 4, 74. A.B, Univ. of Vermont, 97; A.M, Columbia Univ, 99; Ph.D, 00; N. Y. Bot. Garden, 99–00. Director, Fairbanks Mus. Nat. Sci, St. Johnsbury, Vermont, 01–02; asst. bot, Barnard Coll, 02–03; tutor, 03–07; instr. 07–10; *asst. prof, 10–*. Algae, chiefly Chlorophyceae.

Hedgcock, George Grant, U. S. Dept. of Agric, Washington, D. C. Augusta, Ill. Oct. 5, 63. B.S, Nebr. Univ, 99; fellow, A.M, 01; Ph.D, Washington Univ. (St. Louis) 06; Missouri Bot. Gard, 02; Mississippi Valley Lab, 07; N. Y. Bot. Garden, 10. Principal pub. schools, Oak, Nebr, 91–93; Ruskin, Nebr, 93–95; asst. bot. Nebr. Univ, 99; scientific aid, bur. plant indust, U. S. Dept. Agric, 01; asst. pathologist, 02–08; *pathologist 08–*. F. A. A. A; Bot. Soc. Am; Phytopath. Soc; Wash. Bot. Soc; Wash. Biol. Soc; Int. Assoc. Bot. Phytopathology, fungous and mistletoe diseases of forest trees.

Henry, Florence (Mrs. Hervey W. Shimer), Mass. Inst. of Technology, Boston, Mass. Sacramento, Calif, Sept. 24, 79. N. Y. State Nor. School, Cortland, N. Y, 97; A.B, Cornell Univ, 01; A.M, Columbia Univ, 02; Columbia Univ. and N. Y. Bot. Garden, 02–03. Paleobotany.

Hewins, Nellie Priscilla, Elmhurst, N. Y. Maspeth, N. Y, Jan. 20, 78. B.S, Cornell Univ, 98; grad. student, Cornell Univ, 98–99; A.M, Columbia Univ, 00; Teachers Coll, 00, 07–08, 08–09 (secondary diploma, 00); Cold Spring Harbor, summer, 01; Cornell Univ, summer, 05; Alliance Francaise, Paris, summer, 03; Stern School of Languages, 03–05; N. Y. Bot. Garden, 99–00, 04–05; Teachers Coll, Columbia Univ. 07–08; Columbia Univ, summer, 08; *N. Y. Univ, 10–*, Teacher sci, South Orange H. S, 01; *instr. biol, Newtown H. S, Elmhurst, L. I, 01–*. A. A. A. S; N. E. A; N. Y. Assoc. Biol. Teachers; N. Y. State Teachers Assoc. Biology.

Hockaday, Ela. N. Texas Nor. School; N. Y. Bot. Garden 05–06. Lichen flora of Texas; morphology.

Holm, Herman Theodor. Brooklyn, D. C. Copenhagen, Den-

mark, Feb. 3, 54. Grad. Copenhagen, 80; Ph.D, Catholic, 02; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 03. Botanist and zoologist, Danish North Pole Exped, 81–82; traveled in West Greenland as botanist and zoologist for the Danish Government, summer, 84, 85, 86; asst. bot, U. S. Nat. Mus, 88–93; U. S. Dept. Agric, 93–96. Danish, Swedish, French, German and Canadian scientific societies. Anatomy and morphology of phanerogams.

Horne, William Titus, Univ. of Calif, Berkeley, Calif. Kankakee, Ill, 76. B.S, Univ. of Nebr, 98; grad. student, 98–00; fellow, Columbia Univ. and N. Y. BOT. GARDEN, 03–04. Instr. bot. Nebr. Wesleyan Univ, 98–00; instr. bot. Univ. of Nebr, Sch. of Agric, summer school, 99–00; asst. plant path, Estacion Cent. Agron. de Cuba, 04–07; chief of dept. veg. path, 07–09; *asst. prof. plant path, Univ. of Calif, 09–*. Bot. Seminar (Univ. of Nebr.); Phytopath. Soc. Diseases of tropical plants, olive knot, root rot of trees (*Armillaria*).

House, Homer Doliver. Biltmore, N. Carolina. Oneida, N. Y, July 21, 78. B.S, Syracuse Univ, 02; N. Y. BOT. GARDEN, 03–04; M.A, Columbia Univ, 04; Ph.D, 08. Asst. bot, Columbia Univ, 02–03; substitute teacher bot, Rutgers Coll, 04; aid, U. S. Nat. Mus, Div. Plants, 04–05; Bur. Plant Indust. U. S. Dept. of Agric, 05–06; assoc. prof. bot. and bact, Clemson Coll, S. Carolina, 06–07; AID, N. Y. BOT. GARDEN, 07–08; *assoc. director and lecturer bot. and dendrology, Biltmore Forest School, 08–*. Taxonomy.

Howe, Regnald Heber, Jr. Middlesex School, Concord, Mass. Quincy, Mass, Apr. 10, 75. Special student Lawrence Scientific School, 98–01; Harvard Univ; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 09. *Teacher sci, Middlesex School, 01–*. Am. Ornith. Soc; Boston Soc. of Nat. Hist; National Geographic Soc; Biol. Soc. of Washington. Morphology, taxonomy and geographical distribution of lichens, family Usneaceae and foliose and fruticose lichens in general.

Hoyt, William Dana, Rutgers Coll, New Brunswick, N. J. Rome, Georgia, April 16, 80. A.B, Univ. of Georgia, 01; M.S, 04; Johns Hopkins Univ, 04–09; fellow, 08–09; Bruce

fellow, 09; Ph.D, 09; N. Y. Bot. Garden (Cinchona) 06; Univ. of Heidelberg, 09–10; Stazione Zoologica Naples, 10; Fishers Lab, Beaufort, N. Carolina, 03–09. *Instr. botany, Rutgers Coll, 10–.* A. A. A. S; Torrey Bot. Club. Plant physiology, algae.

Humphreys, Edwin William, 406 E. 85 St, N. Y. City. New Jersey, June 15, 83. A.B, Coll. of the City of N.Y, 03; Columbia Univ, summer school, 04, 05; M.A, 06; N. Y. Bot. Garden (voluntary asst. to Dr. Hollick) 05–. *Teacher in the elementary schools, N. Y. City, 03–.* N. Y. Acad. Sci. Geology, paleobotany.

Humphrey, Clarence John, Forest Service, U. S. Dept. of Agric, Madison, Wisconsin. Wakeman, Ohio, Mar. 3, 82. A.B. and B.Sc. (in forestry), Univ. of Nebraska, 06; Cornell Univ, 07–08; 08–09; N. Y. Bot. Garden, winter, 07–08. Asst. in botany (mycology), Cornell Univ, 07–09; *Forest Service, U. S. Dept. Agric, 09–.* F. A. A. A. S; Am. Phytopath. Soc; Sigma Xi. Pathology, with reference to the timber diseases.

Irving, Mrs. Leonard. (See Rennert, Rosina Julia.)

Isham, Florence, N. Y. Bot. Garden, 02–03. Taxonomy of local sedges.

Jackson, Herbert Spencer, Corvallis, Oregon. Augusta, N. Y, Aug. 29, 83. A.B, Cornell Univ, 05; N. Y. Bot. Garden, 07, 08. Asst. bot. (mycology), Cornell Univ, summer school, 04; also 04–05; instr. bot, Delaware Coll. and asst. plant path, agric. exp. station, Newark, Del, 05–07; N. Y. Bot. Garden, 08; Austin Teaching Fellow in bot, Harvard Univ, 08–09; asst. in plant path, Oregon Agric. Coll. and exp. station, 09–10; *prof, 10–.* Mycology, pathology and taxonomy of fungi.

Johnson, Duncan Starr, Johns Hopkins Univ, Baltimore, Md. Cromwell, Conn, July 21, 67. B.S, Wesleyan Univ, 92; Ph.D, Johns Hopkins Univ, 97; N. Y. Bot. Garden (Cinchona), 03, 06, 10. Curator, Mus. Brooklyn Inst, 97; Munich, 01; *in charge biol. lab, Brooklyn Inst, –96;* assoc. bot. Johns Hopkins Univ, 98–01; assoc. prof, 01–06; *prof. 06;* Bot. Soc. Am. (Sec'y, 06–09) F. A. A. A. S; Torrey Bot. Club. Plant embryology; marine algae; plant distribution.

Kellicott, William Erskine, Goucher Coll, Baltimore, Md. Buffalo, N. Y, April 5, 78. Ph.B, Ohio State Univ, 98; Ph.D, Columbia Univ, 04; N. Y. BOT. GARDEN, 99–00. Asst. zool, Barnard Coll, Columbia Univ, 01–03; tutor, 02–05; instr. 05–06; *prof. biol, Goucher Coll, 06–*. F. A. A. A. S; Soc. Nat; Soc. Zool; N. Y. Acad. Sci. Vertebrate morphology, embryology.

Kern, Frank Dunn, Purdue Univ, Lafayette, Ind. Reinbeck, Iowa, June 29, 83. B.S, State Univ. of Iowa, 04; M.S, Purdue Univ, 07; Ph.D, Columbia Univ, 11; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 06, 07, 08, 10; fellow, Columbia Univ, 10–11 and N. Y. BOT. GARDEN, 10–11. Lab. asst. animal morph. and physiol. Univ. of Iowa, 02–04; special agt. bureau of pl. indust, U. S. Dept. Agric, 04–05; collaborator, bureau of pl. indust, 07; asst. and *later assoc. bot., Purdue Univ, Agric. Exp. Station 05–; inst. crypt. bot, Purdue Univ. 10–.* F. A. A. A. S; Ind. Acad. Sci; Torrey Bot. Club; Bot. Soc. Am; Phytopath. Soc; Sigma Xi. Mycology, pathology, uredinology.

Kimura, Tokuzo. Hirobuchi, Miyagiken, Japan, Dec. 2, 80. Sapparo Agric. Coll, Japan, 04; A.B, Stanford Univ, 06; Columbia Univ. and N. Y. BOT. GARDEN, 07–08; Tohoku Gakuin Missionary Coll, Sendai, Japan, 01–03; *Sotokufu Chugakko (Government Middle School), 09–*. Biology, sex-determination in plants.

King, Cyrus Ambrose, 431 E. 4th St, Brooklyn, N. Y. Plum Tree, Indiana, June 19, 67. A.B, Indiana Univ, 93; A.B, Harvard Univ, 97; A.M, 98; Ph.D, 02; N. Y. BOT. GARDEN, 03–04, 05. Teacher nat. sci, H. S, Decorah, Ia, 93–96; asst. bot. Harvard Univ, 96–00; asst. bot, summer school, Harvard Univ, 97–01; Radcliff Coll, Mass, 99–00; instr. Ind. Univ. 00–02; instr. in charge bot. biol. station, Indiana Univ, summer, 02; teacher biol, DeWitt Clinton H. S, N. Y. City, 02–07; *first asst. biol, Erasmus Hall H. S, Brooklyn, N. Y, 07–*. F. A. A. A. S; Soc. Nat. Cent. States; Torrey Bot. Club; N. Y. Assoc. Biol. Teachers. Cytology.

Kirkwood, Joseph Edward, Univ. of Montana, Missoula, Mont.

Cedar Rapids, Iowa, Jan. 24, 72. A.B, Pacific Univ. Oregon, 98; special fellow in biol, Princeton, 98–99; A.M, 02; Columbia Univ. and N. Y. Bot. Garden, 99–01, N. Y. Bot. Garden, 02; RESEARCH SCHOLAR, 04; Ph.D, Columbia Univ, 03. Desert Bot. Lab, Tucson, Arizona, 08–09. Asst. in bot, Columbia Univ, summer school, 00; asst. in biol, Teachers Coll, Columbia, 00–01; instr. bot, Syracuse Univ, 01–03; assoc. prof. bot, 03–07; prof. bot. and head of dept, 07; asst. bot, dept. invest, Continental-Mexican Rubber Co, 07; asst. prof. bot. and forestry, Univ. of Montana, 09–10; *prof. and head dept. bot. and forestry, 10–*. F. A. A. A. S; Sigma Xi; Torrey Bot. Club. Economic botany, embryology, physiology.

Knox, Alice Adelaide, Lakewood, N. Jersey. Point Pleasant, N. Jersey, Aug. 28, 76. A.B, Smith Coll, 99; A.M, Columbia Univ, 06; N. Y. Bot. Garden, 04–05. Demonstr. bot, Smith Coll, 00–01; asst. bot. Barnard, 03–05; asst, Cold Spring Harbor, 04; lab. asst, N. Y. Bot. Garden, 05–06; asst. Dept. Bot. Res. Carnegie Inst, 06–07; teacher, The Knox School, Lakewood, N. J; principal private school, Upper Montclair, N. J, 09–11; *principal private school, Utica, N. Y, 11–*. Torrey Bot. Club; Barnard Bot. Club. Plant morphology, physiology.

Kornmann, Elsie W, Nor. Coll, N. Y. City; N. Y. Bot. Garden, 00–01.

Kupfer, Elsie M, 44 W. 97 St, N. Y. City. Bayreuth, Germany, Sept. 5, 77. A.B, Barnard Coll, Columbia Univ, 99; A.M, Columbia Univ, 01; Ph.D, 07; Columbia Univ. and N. Y. Bot. Garden, 01–. Asst. bot, Columbia Univ, summer school, 01, 02; teacher biol, L. I. City H. S, 02; teacher biol, Wadleigh H. S, 03–09; *head dept. biol, 09–*. Wild Flower Pres. Soc. Am; A. A. A. S; Torrey Bot. Club; N. Y. Biol. Teachers Assoc; H. S. Teachers Assoc; Barnard Bot. Club, Physiology of water storage on desert plants.

Leavenworth, George, Greenville, Mass. St. Genevieve, Mo, Sept. 30, 75. A.B, Univ. of Missouri, 02; N. Y. Bot. Garden 02–03; Columbia Univ, 03. *Connected with the firm of J. H. Leavenworth & Son, manufacturers of hardwood lumber*, Greenville, Miss. Forestry.

Lewis, Ivey Foreman, Ashland, Vermont. Raleigh, N. Carolina, Aug. 31, 82. A.B, Univ. of N. Carolina, 02; M.S, 03; Fisheries Lab. Beaufort, N. C, 02, 05, 06, 09; Cold Spring Harbor, 04, 05; Johns Hopkins Univ, 03–08, fellow, 06–08; N. Y. BOT. GARDEN (CINCHONA), 06; Marine Biol. Lab, Naples, 07–08; Woods Hole, 06, 07, 10, 11. Acting prof. biol, Randolph-Macon, 05–06; *prof. 08–*; instr. bot, Woods Hole, 07, 10, 11; asst. Univ. N. Carolina, summer, 03, instr. bot, summer, 04. Algae.

Liebovitz, Sidney, Coll. P. & S, Columbia Univ, N. Y. City. N. Y. City, Dec. 4, 87. Coll. of the City of N. Y, 02–05; *Columbia Univ*, 05–. Botanical chemistry.

Livingston, Burton Edward, Johns Hopkins Univ, Baltimore, Md. Grand Rapids, Mich, Feb. 9, 75. B.S, Univ. of Mich, 98; Ph.D, Chicago Univ, 01; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 03. Asst. bot. lab. Univ. of Mich, 95–98; instr. sci. H. S. Freeport, Ill, 98–99; asst. plant physiol, Chicago Univ, 99–04; assoc, 04; field work, Mich. Geol. Surv, 01; collaborator, U. S. Bureau Forestry, 02; instr. biol, summer school, Eastern Ill. State Nor. School, 03; Carnegie research asst, 04; soil expert, U. S. Bureau of Soils, 05–06; Desert Bot. Lab, Carnegie Inst, 06–09; *prof. plant physiol, Johns Hopkins Univ, 09–*. F. A. A. A. S; Am. Soc. Nat; Bot. Soc. Am; Walker prize, Boston Soc. Nat. Hist, 03. Plant physiology, ecology, soil physics.

Livingston, Mrs. Flora Virginia. N. Y. BOT. GARDEN, 04, 05.

Locke, Emily Pauline. B.L, Smith Coll, 00; N. Y. BOT. GARDEN, 02.

MacIntyre, Lucy. N. Y. City, Dec. 5, 64. Miss Leverett's School, N. Y. City, 73–79; The Misses Graham School, 79–83; Dresden, Germany, 83, 84; N. Y. BOT. GARDEN, 03–04, 05, 06, 07, 08. A. A. A. S; Torrey Bot. Club; League for Political Education. Morphology of algae; general bryology.

Marble, Delia West. N. Y. City, 68. Special student, Columbia Univ, 97–98, 05; N. Y. BOT. GARDEN, 01–02. Torrey Bot. Club; Wild Flower Pres. Soc. Private tutoring in botany.

Mathewson, Chester A. Cincinnati, Ohio, Dec. 11, 78. Chicago Univ, 99; Cincinnati, 01–03; Yale Univ, 03–04; N. Y. Bot. Garden, 04–05; B.S, Columbia Univ, 05; A.M, 06; Coll. of P. & S, Columbia Univ, 07. Instr. Technical School of Cincinnati, 98–03; Teachers Coll, Columbia Univ, 05–06; Plainfield H. S, N. J, 06–07; H. S, Commerce, N. Y. City, 07. Am. Nat. Stud. Soc; N. Y. Assoc. Biol. Teachers (secy.).

Maxon, William Ralph, U. S. Nat. Mus, Washington, D. C. Oneida, N. Y, Feb. 27, 77. Ph.B, Syracuse Univ, 98; N. Y. Bot. Garden, 03; research scholar, 05; asst. N. Y. Bot. Garden, 98; aid, crypt. bot. Div. of Plants, U. S. Nat. Mus, 99–05; *asst. curator, 05–.* F. A. A. A. S; Linn. Fern. Chapter (pres, 00–01); Bot. Soc. Washington; Washington Acad. Sci; Wild Flower Pres. Soc. Am. (charter mem.) Taxonomy of ferns.

Middleton, Florence, 366 St. Nicholas Ave, N. Y. City. New London, Conn, Aug. 2. 63. B.S, Columbia Univ, 10; Nor. Coll, N. Y. City, 85; Teachers Coll, Columbia Univ, 00–02; Barnard Coll, 02–08; Cold Spring Harbor, 04; N. Y. Bot. Garden, 05–06, 10–11. *Asst. teacher biol, Wadleigh H. S, N. Y. City, 04–.* Wild Flower Pres. Soc. Am. Botany, morphology, *Saponaria.*

Millspaugh, Charles Frederic, Field Mus. of Nat. Hist, Chicago, Ill. Ithaca, N. Y, June 20, 54. Ithaca Acad, 69–71; Cornell Univ, 72–75; M.D, N. Y. Homeop. Med. Coll, 81; N. Y. Bot. Garden, 03–. Prof. bot. W. Virginia, 91–92; *curator, dept. bot, Field Mus. Nat. Hist, 94–; professional lecturer bot, Chicago Univ, 95–; prof. med. bot, Chicago Homeop. Med. Coll. 96–.* Mem. Pan. Am. Commission Med. Plants, 99–01; Wild Flower Pres. Soc. Am. (charter mem, *director, 02–*); Mexican Med. Soc. (hon. fellow); Brazilian Med. Soc; Torrey Bot. Club; A. A. A. S; Soc. Nat. Cent. States; Sigma Xi; Geogr. Soc. Chicago; editor, Homeop. Recorder, 89–90; studied at various times in herbarium, N. Y. Bot. Garden and other Am. Herbaria, Kew, British Mus. Nat. Hist; Linnaean Soc; Owen's Coll; Manchester; Leyden; Berlin; Praag; Vienna; Florence; Geneva; and Paris. Taxonomic botany, flora of the West Indies.

Molwitz, Ernestine. A.B, Columbia Univ, 02; N. Y. BOT. GARDEN, 01–03. Plant anatomy and physiology.

Mulford, Fannie Augusta. Nevada City, Calif, Sept. 20, 55. N. Y. BOT. GARDEN, 02–03. Wild Flower Pres. Soc. Am. (charter mem.); Torrey Bot. Club. Flora of Long Island.

Murrill, William Alphonso, N. Y. Bot. Garden, N. Y. City. Campbell County, Virginia, Oct. 13, 69. Virginia Polytechnic Inst, agric. course, 86; B.S, and mechan. course, 87; B.S, Randolph-Macon Coll, 89; A.B, 90; A.M, 91; Ph.D, Cornell Univ, 00; N. Y. BOT. GARDEN, 01–04. Prof. nat. sci, Bowling Green Sem, Virginia, 91–93; prof. nat. sci, Wesleyan Female Inst, Virginia, 93–97; scholar in bot, Cornell Univ, 97–98; asst. bot, Cornell Univ, 98–99; asst. crypt. botanist, 99–00; teacher biol, De Witt Clinton H. S, N. Y. City, 00–04; ASST. CURATOR, N. Y. BOT. GARDEN, 04–05; FIRST ASST, 06–07; *asst. director, 08–*. Sigma Xi; Torrey Bot. Club; Bot. Soc. Am; Phytopath. Soc; *editor, Mycologia;* Jour N. Y. Bot. Garden, 06–08; assoc. editor, Bull. Torrey Bot. Club and Torreya 03–10. Mycology, taxonomy of the higher fungi.

Palliser, Helen Letitia, Cornell Univ. Med. School, Ithaca, N. Y. Bridgeport, Conn, May 4, 82. A.B, Barnard Coll, Columbia Univ, 05; Teachers Coll, Columbia Univ, 03–05; A.M, 06; N. Y. BOT. GARDEN, 05–06; Cornell Univ. Med. School, 09; asst. biol. Vassar Coll, 06–09. Mycology.

Pond, Raymond Haines, Agric. Coll. Station, Texas. Topeka, Kansas, March 3, 75. B.S, State Agric. Coll. of Kansas 98; M.S, 99; Ph.D, Univ of Mich, 02; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 05, 06, 07; Bonn and Strass, 07–08. Asst. bot, Kan. State Agric. Coll, 95–98; asst. chem, 97–98; asst. in charge of herb, Univ. Mich. 98–99; asst. plant physiol, 99–00; spec. investigator, Bur. Fisheries, 99–00, 01; asst. bot. and path, Maryland Agric. Coll. and Exp. Station, 00–01; instr. chem. and biol, Township H. S, Sterling, Ill, 02–03; prof. bot. and pharmacog, and director lab, Northwestern Univ, 03–07; asst. plant physiol, Chicago, summer, 06; biologist Metropolitan Sewerage Commission, N. Y. City, 08–09; *plant pathologist, Texas Experiment Station, 09–*. F. A. A. A. S; Bot. Soc.

Am; Bot. Cent. States; Phytopath, Soc; Sigma Xi; Am. Soc. Biol. Chem. (charter mem.) Plant physiology.

Rand, Edith Edwina, 700 W. End Ave, N. Y. City. Norwich, Conn. A.B, Smith Coll, 99; fellow, 99–00; Woods Hole, fellow zool, 00; fellow bot, 01; N. Y. BOT. GARDEN, 01–02; A.M, Teachers Coll, Columbia Univ, 02; lab. asst. zool, Smith Coll, 97–00; teacher biol. sci, Horace Mann H. S, 02–07. Botany.

Rea, Paul Marshall, The Charleston Museum, Charleston, S. Carolina. Cotuit, Mass, Feb. 13, 78. Woods Hole, 98–99; A.B, Williams Coll, 99; Columbia Univ, and N. Y. BOT. GARDEN, 99–00; A.M, Williams Coll, 01; Columbia Univ, 02–03. Asst. biol, Williams Coll, 00–02; field asst, Bur. of Forestry, U. S. Dept. of Agric. 02, 03; *prof, Coll. of Charleston and director Mus,* 03–; *instr. Woods Hole, 06–.* Am. Assoc. Museums (*secy,* 07–); A. A. A. S; *editor, Bull. Charleston Mus,* 03–; Contr. from Charleston Mus; Proc. Am. Assoc. Mus; Compiler, Directory of Am. Museums. Museum administration.

Rennert, Rosina Julia (Mrs. Leonard Irving). N. Y. City, July 8, 78. A.B, Nor. Coll. N. Y. City, 97; A.B, Columbia Univ, 01; A.M, 02; N. Y. BOT. GARDEN, 99–01, 02–04. *Asst. teacher biol, Washington Irving H. S, N. Y. City,* 02–03; Wadleigh H. S, N. Y. City, 03–07. A.A.A.S. Plant anatomy, physiology.

Robinson Chalres Budd, Bureau of Science, Manila, P. I. Pictou, Nova Scotia, Oct. 26, 71. A.B, Dalhousie, Halifax, 91; Cambridge Eng, 97–98; Christ's Coll, 98–99; Columbia Univ. and N. Y. BOT. GARDEN, 03–06; Ph.D,Columbia Univ, 06. Teacher, Kings County Acad, N. S, 92–93; Pictou County Acad, 93–97, 99–03; night schools, N. Y. City, 03–06; ASST. CURATOR, N. Y. BOT. GARDEN, 06–07; econom. bot. Bureau of Science, Phil. Govt, 08–11. Torrey Bot. Club; Bot. Soc. Am; Nova Scotian Inst. of Sci; Sigma Xi. Systematic botany.

Robinson, Winifred Josephine, Vassar Coll, Poughkeepsie, N. Y. Johnstown, Mich, Oct. 17, 67. Mich. State Nor. Coll, 92; Mich. Agric. Coll, summer, 94; B.S, Univ. of Mich, 99; B.Pd, 99; Woods Hole, summer (Mich. Univ. Table) 99, (Vassar Coll. Table) 00; N. Y. BOT. GARDEN, 02, (CIN-

CHONA) 04, 07–08; RESEARCH SCHOLAR, 03, 09; M.A, Columbia Univ, 04; Berlin Univ. Herb, Germany, summer, 05. Instr. training dept, Mich. State Nor. Coll, 93–05; LAB. ASST, N. Y. BOT. GARDEN, 07–08; *instr. biol, Vassar Coll*, 00–. F.A.A.A.S; Am. Soc. Nat; Torrey Bot. Club; National Conserv. Assoc; National Arts Club. Taxonomy of ferns.

Rose, Anton Richard, Dept. of Biol. Chemistry, Columbia Univ, N. Y. City. Washington Co, Minn, Feb. 22, 77. Gustavus Adolphus Coll, Minn, 00–04; B.S, 04; Scheffield Scientific School laboratories, under Yale Graduate School, 07–08; M.S; N. Y. BOT. GARDEN, 10–. Instr. chemistry, N. Hampshire Coll. Agric. and Mechan. Arts, 04–06; asst. chemist (research in nutrition), 06–07, 08–10; *asst. Dept. Biol. Chem, Columbia Univ, 10–*. Am. Chem. Soc. Biological chemistry, status of ash constituents in the life history of the plant and its relation to animal nutrition.

Rubrecht, William Keller. A.B, Muhlenberg Coll, 01; N. Y. BOT. GARDEN, 02. Algae; fungi.

Sage, Lillian Belle, 34½ E. 12 St, N. Y. City, or Norwich, N. Y. Norwich, N. Y. A.B, Mt. Holyoke Coll, Mass, 01. N. Y. BOT. GARDEN, 06–09. Teacher biol, Washington Irving H. S, N. Y. City, 02–09; *head dept. biol, 09–*. Flora of Chenango Co.

Scott, George Gilman, The Coll. of the City of New York, N. Y. City. A.B, Williams Coll, Mass, 99; N. Y. BOT. GARDEN, 99. *Teacher of zoology, Coll. of the City of New York.* Zoology.

Schwarze, Carl Alois, 92 Stagg St, Brooklyn, N. Y. Brooklyn, N. Y, Sept. 27, 86. B.S, (in agric.) Missouri State Univ, 09; Columbia Univ. and N. Y. BOT. GARDEN, 09–. Student asst. in bot. Missouri State Univ. 09. Torrey Bot. Club. Mycology, pathology and physiology, taxonomy of ascomycetes.

Schwartz, Edith (Mrs. F. E. Clements), Univ. of Minn, Minneapolis, Minn. A.B, Univ. of Nebr, 98; Ph.D, 04; N. Y. BOT. GARDEN, 02. *Instr. Univ. of Minn, 09–*.

Seaver, Fred Jay, N. Y. Bot. Garden, N. Y. City. Webster Co, Iowa, 77. Chicago Univ, summer school, 01; B.S, Morningside Coll, Iowa, 02; scholar, State Univ. of Iowa, 02–03; special asst. to Dr. Arthur, Purdue Univ, Agric. Exp. Station,

spring, 03; fellow, State Univ. of Iowa, 03–04; M.S, 04; expl. exp. to N. Mexico, State Univ. of Iowa, spring, 04; fellow, Columbia Univ. 06–07 and N. Y. Bot. Garden. Instr. bot. State Univ. of Iowa, summer school, 03, 04; asst. bot, 04–05; instr. (in full charge) biol, Iowa Wesleyan Univ, 05–06; elected prof. biol, 06; asst. prof. bot. N. Dak. Agric. Coll. and mycologist to the agric. exp. station, 07–08; *director of the laboratories, N. Y. Bot. Garden, 08–.* Fellow Iowa Acad. Sci; Mrs. William Larrabee research prize, 04; Phytopath. Soc; Torrey Bot. Club; Bot. Soc. Am; Columbia Univ. Biochemical Assoc; Sigma Xi; *assoc. editor, Mycologia, 09–; editor, Jour. N. Y. Bot. Garden 11–.* Mycology, phytopathology, taxonomy, morphology and physiology of ascomycetes.

Selby, Augustine Dawson, Ohio Agric. Exp. Station, Wooster, Ohio. Athens Co, Ohio, Sept. 2, 59. B.S, Ohio State Univ, 93; N. Y. Bot. Garden, 03–04. Supt. of schools, Huntington, W. Virginia, 84–86; principal, H. S, Ironton, Ohio, 86–87; teacher bot. H. S, Columbus, Ohio, 90–94; botanist and chemist, Ohio Agric. Exp. Station, 94–02; *botanist, 02–.* F. A. A. A. S; Bot. Soc. Am; Bot. Cent. States; Ohio Hort. Soc. (chairman, Comm. Veg. Path, 95); Ohio Acad. Sci, (pres, 01); Columbus Hort. Soc. (secy, 88–89, 91–94); St. Louis Acad. Sci; Torrey Bot. Club; Am. Phytopath. Soc. (*pres, 11–*). Plant diseases.

Shear, Cornelius Lott, U. S. Dept. of Agric, Washington, D. C. Coeymans Hollow, N. Y, March 23, 65. N. Y. State Nor. School, Albany, N. Y, 88; scholar, Univ. of Nebr, 94–97; B.S, 97; fellow, 97–98; A.M, 01; RESEARCH SCHOLAR, N. Y. Bot. Garden, 03; Ph.D, George Washington Univ, 06; studied in various European laboratories and herbaria three months, 05. Spec. field agt, Div. of Agrost, U. S. Dept. Agric, summer, 95, 96, 97; asst. agrost, U. S. Dept. Agric, 98–01; asst. path, 01–02; *path, 02–.* F. A. A. A. S; Bot. Soc. Am; Wash. Biol. Soc; Bot. Soc. Wash; Wild Flower Pres. Soc. Am. (chart. mem.) Phytopath. Soc. (chart mem.) (*secy-treas, 09–*); International Assoc. Bot; Sigma Xi; editor, phytopath, and myc, revised edition Century Dict; *assoc editor, Mycologia; coeditor,*

Phytopathology. Plant pathology, mycology, taxonomy of pyrenomycetes.

Shimer, Mrs. Hervey W. (See Henry, Florence.)

Shimer, Hervey Woodborn, Mass. Inst. of Technology, Boston, Mass. Martin's Creek, Pa, April 17, 72. Gettysburg, 91–93; A.B, Lafayette Coll, Pa, 99, A.M, 01; Ph.D, Columbia Univ, 04; N. Y. BOT. GARDEN, 02–03; Harvard Univ, 04–05. Tutor, mod. lang, Lafayette Coll, 99–01; asst. paleont, Columbia Univ, 02–03; non-res. lecturer stratig. geol, Mass. Inst. Tech, 03; instr, 03–08; *asst. prof. paleontology, 08–;* instr. hist. geol, and physiog, Yale Univ, summer school, 07. F. A. A. A. S; Boston Soc. Nat. Hist; Am. Anthrop. Assoc; Nat. Geog. Soc; Am. Forestry Assoc; Assoc. of Ph.D's of Columbia Univ; Sigma Xi. Geology, stratigraphy, paleontology, morphology.

Shoemaker, Cornelia Janney. A.B, Swarthmore Coll, 94; N. Y. BOT. GARDEN, 01–02. Instr. Friends' Seminary, N. Y. City. Plant physiology.

Shreve, Forrest, Desert Lab, Tucson, Arizona. Easton, Md, July 8, 78. A.B, Johns Hopkins Univ, 01; Ph.D, 05; Bruce fellow, 05–06; HON. ASST, N. Y. BOT. GARDEN, (CINCHONA) 05–06; instr. in charge, phanerogamic bot, Biol. Lab, Cold Spring Harbor, 04–05; assoc. prof. bot, Woman's Coll. of Baltimore [Goucher Coll.], 06–08; *Carnegie Inst. Wash, Desert Lab, Tucson, Arizona, 08–;* Torrey Bot. Club; Bot. Soc. Am; A. A. A. S. Plant geography and physiology.

Slater, Florence W. B.S, Cornell Univ, 00; N. Y. BOT. GARDEN, 00–01.

Slosson, Margaret, 852 Lexington Ave, N. Y. City. Paris, France. N. Y. BOT. GARDEN, 02–03, 04. *Asst. curator, N. Y. Bot. Garden, 11–*. Linnaean Fern Chapter (secy, 00–01). Pteridology.

Stewart, Lilian. Carlton Coll; N. Y. BOT. GARDEN, 04–05. Plant physiology.

Stockard, Charles R. B.S, Miss. Coll. of Agric. and Mechanic Arts, 99; N. Y. BOT. GARDEN, 04–05. Cytology.

Stover, Wilmer Garfield, Ohio State Univ, Columbus, Ohio. A.B, Miami Univ; N. Y. BOT. GARDEN, 10. Student asst. bot.

Miami Univ, 10; *instr. bot. Ohio State Univ, 11–.* Taxonomy of gill-fungi.

Streeter, Stella Georgiana, Cummington, Mass. Cummington, Mass, Aug. 6, 74. B.L, Smith Coll, 98; N. Y. BOT. GARDEN, 02–03; M.A, Columbia Univ, 03; Teachers Coll, masters diploma, 03; Bermuda Biol. Lab, 05; Cold Spring Harbor, 06, 08, 10; Cornell Univ, 09; fellow, Smith Coll, 10–11. Head dept. sci. H. S, Hempstead, N. Y, 99–02; teacher biol. H. S, Trenton, N. J, 04–07; teacher bot, H. S, Jersey City, N. J, 07–08. Plant physiology; marine algae.

Sumstine, David Ross, Pittsburg H. S, Pittsburg, Pa. Somerset, Pa, Jan. 21, 70. A.B, Thiel Coll, Greenville, Pa, 90; Luth. Theol. Sem, Chicago, 91–92; Chicago Univ. 03; M.S, Univ. of Pittsburg, 08; Sc.D. (honorary) Pennsylvania Coll, 10; RESEARCH SCHOLAR, N. Y. BOT. GARDEN, 09, 10. Principal, Ligonier pub. schools, 93–94; supt. Apollo pub. schools, 94–99; Kittanning pub. schools, 99–05; Turtle Creek pub. schools, 05–09; *Pittsburg H. S, principal East High Division (and teacher of sci.), 09–; asst. bot, Carnegie Museum, Pittsburg, 03–.* A. A. A. S; Bot. Soc. of Western Pa. (pres. 06–07); Torrey Bot. Club. Mycology, pathology, Mucorales and Hyphomycetes of North America.

Torrey, John Culter, Cornell Univ. Medical Coll, N. Y. City. Burlington, Vermont, April 19, 76. A.B, Vermont Univ, 98; N. Y. BOT. GARDEN, 99–00; Columbia Univ, Ph.D, 02; fellow, exp. path, Cornell Medical Coll, 04–. Asst. zool, Columbia Univ, 00–01; bacteriologist, Sea Side Hosp, Staten Is, N. Y, 03–04; asst. instr, histol. and bacter, Cornell Univ, Medical Coll, 03–04; *asst. prof. exp. path. and lecturer in hygiene, 10–*; Soc. Exp. Biol. and Med; Am. Assoc. of Pathologists and Bacteriologists. Hygiene, bacteriology.

Thom, Charles, Agric. Exp. Station, Storrs, Conn. Minonk, Ill, Nov. 11, 72. A.B, Lake Forest Coll, Ill, 95; A.M, 97; Missouri State Univ. 97–99; Ph.D, 99; Woods Hole, summer, 97; Bureau of Plant Industry, Washington, D. C, summer, 01; Cornell Univ, 02–04; mycological investigation, Storrs, Conn, 04–11; N. Y. BOT. GARDEN, 10. Asst. Lake Forest, 96–97;

instr. biol, Missouri State Univ, 97–99; instr. bot. 99–01; asst. prof. bot. 01–02; asst., in mycology, Cornell Univ, 02–04; *mycologist in cheese investigation, U. S. Dept. Agric, 04–.* F. A. A. A. S; Bacteriological Soc; Phytopath. Soc; Assoc. Bot. Soc. Am; Conn. Bot. Soc; National Dairy Instructors Assoc. Pathology, mycology, taxonomic and physiological studies in *Penicillium* and *Aspergillus*, organic agents in cheese ripening.

Uhlig; William Cullen. New York, Dec. 22, 70. Ph.B, Columbia Univ, 96; Ph.D, 04; N. Y. BOT. GARDEN, 02–03. Asst. analyt. chemist, Columbia Univ, 99. Soc. Chem. Industry; Nat. Geog. Soc. Sanitation, water supply.

Valentine, Morris Crawford. N. Y. City, April 18, 76. A.B, Coll. of the City of New York, 96; Coll. of P. & S, Columbia Univ, 96–98; Path. Inst, State Hospitals for Insane, 98–01; N. Y. BOT. GARDEN, 04. Teacher chemistry, Harlem Evening H. S, for Men, N. Y. City, 00–04; asst. teacher biol, De Witt Clinton H. S, N. Y. City, 01–04; Wadleigh H. S, N. Y. City, 04–08. A. A. A. S. Teaching of biology.

Wang, Chung Yu. Univ. Tientsin, China, 99; A.M, Columbia Univ, 04; N. Y. BOT. GARDEN, 04–05. Paleobotany.

Watterson, Ada (Mrs. Robert M. Yerkes), 3 Fuller Place, Cambridge, Mass. Cleveland, Ohio. A.B, Columbia Univ, 98; A.M, 00; N. Y. BOT. GARDEN, 99–00; Marine Biol. Lab, Cold Spring Harbor, 99, 01; Marine Biol. Lab, Woods Hole, 00, 06; Harvard Univ, summer school, 06. Asst. bot. Barnard Coll, 99–02; asst. bot. and zool, 01–02; tutor biol, Teachers Coll, Columbia Univ, 02–05; instr. nat. study, Columbia Univ, summer school, 04, 05. Plant and animal physiology.

Whipple, Dorris William. Ph.G, N. Y. Coll, Pharmacy, 01; N. Y. BOT. GARDEN, 02. Bacteriology.

White, Violette S. (Mrs. John Ross Delafield). N. Y. BOT. GARDEN, 01–02. Fellow, Wild Flower Pres. Soc. Am; Torrey Bot. Club; N. Y. Bot. Garden (life member). Taxonomy.

Wilcox, Edwin Mead, Univ. of Nebraska, Lincoln, Nebr. Busti, N. Y, May 21, 76. B.S, Ohio State Univ, 96; A.M, Harvard Univ, 98; Ph.D, 99; fellow, 99–00; N. Y. BOT. GARDEN, 04.

Asst. bot, Ohio State Univ, 94–97; prof. bot. and entom, Okla. Agric. and Mechan. Coll, 00–01; biol. and hort, Ala. Polytech. Inst, 01–04; prof. of bot. and plant physiologist and pathologist, Ala. Exp. Station, 04–08; *prof. agricultural bot, Univ. of Nebr, 08–.* F. A. A. A. S; Am. Soc. Nat; Bot. Soc. Am. Physiology, pathology.

Wilkins, Lewanna, Eastern High School, Washington, D. C, or 1414 Girard St, Washington, D. C. Fairfax Co, Virginia, Jan. 21, 69. B.S, Wellesley, 91; Martha's Vineyard, summer, 92, 94; Woods Hole (Wellesley Coll. Table) 96; C. Hart Merriam's Camp, Mt. Shasta, Calif, summer, 98; Goettingen, Germany, spring and summer, 05; Columbia Univ, summer, 07; N. Y. BOT. GARDEN, 07, 08, 09, 10. *Teacher biol, Eastern H. S, Washington, D. C, 92–.* Wild Flower Pres. Soc. Am. (charter mem.); Biological Soc. of Washington, D. C.; National Geogr. Soc; A. A. A. S. Taxonomy of Solanaceae.

Wilson, Guy West, N. Car. Agric. Coll., Raleigh, N. C. Carmel, Indiana, June 19, 77. B.S, DePauw Univ, 02; A.M, 03; M.S, Purdue Univ, 06; N. Y. BOT. GARDEN, 06–07; prof. biol. and curator mus, Mount Union Coll, Alliance, O, 03–04; instr. bot, Lafayette, H. S, Ind, 04–05; AID, N. Y. BOT. GARDEN, 06–07; prof. biol. and curator mus, Upper Iowa Univ, Fayette, Iowa, 07–10; *asst. vegetable path, N. C. Agric. Exp. Station 10–.* Ind. Acad. Sci; fellow Iowa Acad. Sci; A. A. A. S; Phytopath. Soc. Local flora of Ind; mycology.

Wold, Emma Marie, State Univ, Eugene, Oregon. Trondhjem, Norway, Sept. 29, 73. A.B, Univ. of Oregon, 94; A.M, 97; Univ. of California, summer, 03; Columbia Univ. and N. Y. BOT. GARDEN, 04–05; Univ. of Oregon, 07–08. Instr. sci, Eugene H. S, Eugene, Oregon, 99–04; instr. biol, Mills Coll, Calif, 05–07; instr. bot. Univ. of Oregon, 09–10. Algae.

Womack, Mary Douglas, Wadleigh H. S, N. Y. City. Farmville, Va, Jan. 17, 74. Grad. Va. State Normal School, 91; B.S, Adelphi Coll, Brooklyn, 99; Univ. of Chicago (summer sessions), 90, 93. *Barnard Coll.* and N. Y. BOT. GARDEN 11. Teacher, Adelphi Academy; New Haven H. S; *Wadleigh, H. S.* Bacteriology, phytopathology, fungi.

Wood, George Clayton. Mexico, Oswego Co, N. Y, Feb. 2, 78.

A.B, Syracuse Univ, 00; Columbia Univ. and N. Y. Bot. Garden, 04–05. Teacher hist, Syracuse Class. Prep. School, 99–00; principal, Jefferson Gram. School, Little Falls, N. Y, 00–02; teacher biol, Port Richmond H. S, Port Richmond, Staten Island, N. Y, 02–03; asst. teacher biol, Boys' H. S, Brooklyn, N. Y, 03–08. Am. Acad. Soc. and Polit. Sci; Brooklyn Inst. Arts and Sci. (mem. exec. comm, dept. bot.); publisher, H. S, Biol. Leaflet, Brooklyn, N. Y, 06–08. Plant distribution and ecology; lichenology.

Worthley, Irving Tupper. Cornell Univ. Forest School, 00–02; N. Y. Bot. Garden, 03. Native and cultivated shrubs.

Yamanouchi, Shigeo, Univ. of Chicago, Chicago, Ill. Tokyo, Japan, Sept. 7, 76. M.S, Teachers Coll. Tokyo, 98; Columbia Univ. and N. Y. Bot. Garden, 04–05; Chicago Univ (including Woods Hole Marine Biol. Lab.), 05–07; Ph.D, 07. Asst. prof. Tokyo Teachers Coll, 04; *asst. bot, Chicago Univ, 07–.* A. A. A. S. Cytology.

Yatsu, Naohide. Tokyo, Japan, Sept. 8, 77. A.B, Imper. Univ, Tokyo, 00; Ph.D, Columbia Univ, 05; N. Y. Bot. Garden, 03–05. *Asst. prof. zool. Imperial Univ, Tokyo, Japan, 10–.* Zool. Soc. Zoology, cytology, embryology.

Yerkes, Mrs. Robert M. (See Waterson, Ada.)

York, Harlan Harvey, Univ. of Texas, Austin, Texas. Plainfield, Ind, Sept. 8, 75. B.S, DePauw Univ, 03; A.M, Ohio State Univ, 05; student asst. chem, DePauw Univ, 01–02; tutor human anat. and physiol, DePauw Univ, 01–02; student asst. bot, DePauw Univ, 02–03; fellow, bot, Ohio State Univ, 03–04; asst. bot, 04–05; fellow, Columbia Univ. and N. Y. Bot. Garden, 05–06; spec. asst. bot, Nat. Mus, Washington, 06; assoc. in bot. Biol. Lab, Cold Spring Harbor, 06, 07 elected spec. asst. dendrology, Am. Mus. Nat. Hist, 06; *instr. bot, Texas Univ, 06–.* Ohio Acad. Sci; Texas Acad. Sci; A. A. A. S. Taxonomy.

Zeleny, Charles, Univ. of Ill, Urbana, Ill. Hutchinson, Minn, Sept. 17, 78. B.S, Univ. of Minn, 98; M.S, 01; Ph.D, Chicago Univ, 04; N. Y. Bot. Garden, 01–02. Inst. zool. Univ. of Indiana, 04–07; assoc. prof. 07–09; *assoc. prof. Univ. of Ill, 09–.* F. A. A. A. S; Soc. Zool. Zoology.

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EXPLORATION IN SOUTHERN FLORIDA.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: With your permission, I left New York for tropical Florida on the morning of January 24 of this year. At Washington I was met by Mr. J. J. Carter, of Pleasant Grove, Pennsylvania. Mr. Carter had been previously associated with me in most of our exploration in southern Florida, and had again volunteered his services for field work. We proceeded direct to Miami, and made our exploration headquarters at the Subtropical Garden of the United States Department of Agriculture upon the invitation of Mr. Edmond Simmonds who had charge of that institution.

The time at our disposal was divided between the mainland and the Florida Keys. The season being later than that of our previous sojourn in the region we decided to first explore the already known more interesting localities both near our headquarters and then distant points and other regions previously singled out for attention, but not visited for either lack of time or adverse meteorological conditions, and although our collections have not yet been studied the following account may contain points of general interest.

Beginning with the localities nearest our headquarters both for the sake of convenience and to gradually accustom ourselves to the physical demands of field work incident to that region, we visited the pinelands and Everglades lying about the source of the Miami river, entering them both by boat and on foot. Interesting collections were made especially about the junction

of the pinelands and the Everglades. We collected plants we had not encountered there at earlier seasons, and our most valuable find was a large fruiting specimen of a typically West Indian terrestrial orchid, quite rare in the United States, namely *Platypus*. Other local collecting was done in that ever-prolific area, Brickell hammock, which is now partially within the city limits of Miami and adjacent to its southern boundary. This

FIG. 26. The coastal sand dunes opposite Miami. In the background may be seen the large leaves of the sea-grape, and other shrubs. The foreground is occupied by a plant of a cactus known to grow only in tropical Florida, called *Opuntia austrina*. This plant is peculiar among other opuntias growing east of Texas in bearing numerous starchy tubers, like potatoes, on its underground parts.

limited area has added many novelties to our flora, consisting chiefly of typically Antillean plants, and it is still maintaining its reputation, for since my last report two more additions to our tree flora have been found in its forests. Opportunity was then taken to examine the sand dunes along the coast at points opposite Miami, at the House of Refuge about seven miles further north and on Soldier Key, south of Cape Florida. The

especial object of visiting these localities was to study and collect specimens of one of the very rare and very little known American plants called *Okenia hypogaea*. This plant was collected at the above-mentioned stations during previous work there, and curiously enough it is otherwise known only from southern Mexico! It is a beautiful vine-like plant, with silvery leaves and blue flowers, that creeps over the sand, and it buries its fruits in the sand just as the peanut does. When previously collected, and before its identity was known, we found it growing plentifully; but unfortunately the vegetation there had not yet recovered from the almost annihilating effects of a hurricane of the previous fall, and diligent search was rewarded by the finding of a single young seedling, which was comforting inasmuch as it indicated that the species is not obliterated from the flora of the United States.

Referring to the above-mentioned hurricane which visited southern Florida last October, I may say that it was much more severe and destructive than newspaper reports of it printed at the time indicated. It was a peculiar storm in at least one feature. It was nearly rainless, and clouds of salt spray from the ocean were blown inland undiluted for miles. The effect of this drifting spray on vegetation, especially on the young growth of shrubs and trees, was quite similar to that of fire.

Our only exploration north of Miami was confined to a line between Ft. Lauderdale and Miami. There the tropical plants are greatly diminished and plants more characteristically "Floridian" appear. The section embraces not only hammocks, pinelands and arms of the Everglades, but also patches of the so-called "scrub," which appear to be ancient sand dunes. These ancient dunes do not occur further south in the state. There the strikingly white sand supports a growth of herbaceous, shrubby and arboreous plants, among which the saw palmetto, a widely distributed plant in the southern states, the sand pine, unknown outside of Florida except from a single locality in Alabama, shrubby oaks, some of them known only from southern Florida, and a broom-like plant, a relative of the northern crowberry called *Ceratiola ericoides*, appear to predominate.

After this our attention was directed southward and we began exploration by a tramp over the Everglades, selecting a line several miles in from the shore of Bay Biscayne, for eleven miles below Cutler, thence west six miles to the settlement of Homestead. This move did not yield prolific results, but it gave us an intimate knowledge of some territory we had not before visited. From Homestead we walked to Big hammock prairie, which is a short

FIG. 27. Characteristic plants of the ancient sand dunes or "scrub." The saw palmetto is in the lower right hand corner. The broom-like plant in the foreground is *Ceratiola ericoides*. Back of the latter are scrub oaks, and the background is occupied by trees of the sand pine.

distance from Camp Jackson, thence down the prairie to the Everglades and through new territory including both pineland and front prairie back to Homestead. Recovering from this excursion we retraced our steps southwestward to Camp Jackson, whence we explored new territory to the south, the west and the north. To the southward domelike elevations seeming to rise high above the level prairie attracted our attention. Upon

reaching them we were surprised to find them to be willow-fringed hammocks of bald cypress trees with immense trees at the center, the trees at or near the center and forming the top of the dome often being exceptionally large. In one hammock we encountered perhaps the largest bald cypress ever observed. It measured over eleven feet in diameter near the base, and the spreading branches were as large as ordinary cypress trees themselves.

FIG. 28. A forest fire on the Everglade Keys. This fire swept the keys below Homestead while we were collecting there. The rock denuded of vegetation may be seen in the foreground, while the fire proceeding onward may be seen in the background. The vegetation of the burned areas is restored after the rains begin again; and all the plants that grew there before seem to reappear. The pitch of the Caribbean pine does not flow readily, consequently the trees are not, as a rule, much damaged by these forest fires.

The water was still high in the Everglades and we were not able to get as far west as we had anticipated. Selecting a circuitous route, in order to increase our collecting area, we began our tramp back to Homestead. The course followed was a line five or six miles northward from Camp Jackson through the

Everglades, to the west of and past Camp Longview; thence back through the pinelands until we intercepted the old Camp Longview trail through the woods, then northeastward for some miles along the old trail to a point north of Homestead and finally south to Homestead. This excursion took us through much new territory which proved interesting from many standpoints.

Incidentally we visited several attractive homesteads about Miami. These are developed and used without destroying their natural conditions. One of these was that of Dr. Nevins, which is situated on a high limestone ridge of pineland between Miami and Cocoanut Grove The actual elevation of this ridge is less than twenty feet, but it is locally considered a mountain. Dr. Nevins has made a beautiful homestead there with respect to the natural features of the section. Another place of unusual interest is that of Mr. C. T. Simpson, which is situated on Bay Biscayne between Lemon City and Little River. Mr. Simpson has also preserved the natural features of his land, and in addition he has made a living museum of tropical plants in a beatiful hammock along the shore of the bay. Two particularly interesting plants were encountered there: the one a tree of the galba (*Calophyllum Calaba*) and the other a vine of the sea-bean (*Mucuna urens*), both raised from seed floated from the Caribbean Sea on the Gulf Stream and washed ashore on the nearby coast. This brings up the curious fact that although the seeds of these Antillean plants are frequently washed ashore, both on the Florida Keys and on the coast of the lower part of the peninsula, neither species has yet been found growing naturally in Florida. The nurseries and grounds of Mr. John Soar along the Little River contain much of interest, as regards both exotic plants and natives. One particularly striking plant there is a large specimen the Bahamian-Cuban-Floridian palm, *Paurotis Wrightii*, which has grown from a small plant Mr. Soar and his brother collected near Cape Sable while they were exploring in that region about a dozen years ago.

Having finished our work on the mainland we started for the lower Florida Keys, and our long-cherished desire to begin the exploration of those little known islands was at last gratified. We proceeded over the Key West Extension of the Florida East

Coast Railway, to Marathon, which is situated at the western extremity of Key Vaca. There we met Mr. W. J. Krome, engineer of construction of the Key West Extension, who generously advised us about the keys we intended to visit and kindly placed the facilities of his construction camps at our service.

FIG. 29. Interior of Big Pine Key. The intimate mixture of palms and pines may be seen. There is but one kind of pine, but several kinds of palms. A beautiful specimen of the silver palm stands in the center of the picture. A Bahamian shrub new to the flora of the United States may be seen in the lower left hand corner.

We secured a fishing boat, and crossing the Bahia Honda channel visited seven of the larger keys, namely Sugar Loaf, Cudjoe, Summerland, Ramrod, Big Pine, West Summerland (Spanish Harbor) and Little Pine. We carried out our plans perfectly, with the exception of a visit to No Name Key. The loss of our rudder early in the morning of the last day interfered so with our movements that the examination of No Name Key had to be deferred until a future time. These keys, with the exception of

the outlying West Summerland Keys, are very different from the upper keys, or those lying to the northeast of the Bahia Honda channel. In the first place their axis is at a different angle and they are very irregular in shape. Then too, the vegetation, with the natural exception of the common coastal flora, consists largely of pine trees and palms, either growing separately or intimately intermixed, and also much of the her-

FIG. 30. A saw grass swamp or miniature Everglade on Big Pine Key. These low areas are bordered by a growth of pine trees, palms and shrubs just as the Everglades are on the mainland.

baceous and shrubby vegetation characteristic of the pinelands of the Everglade Keys on the mainland southwest of Miami.

The first thing to attract our attention on the keys was the dead or apparently dead woody vegetation. Skeletons of hardwood shrubs and trees were everywhere. Forests had the appearance of having been fire-swept. In the open places drift wood was piled high and heaps of dead leaves were everywhere. These scenes were examples of the penetrating effect of the

hurricane mentioned above. Big Pine and Little Pine Key were the least damaged of the islands visited. Their coastal hammocks acted to some extent as a barrier to protect the interior from the searching effect of the salt spray. The pine forests which occupy most of the area there are in reality vast level parks with the Caribbean pine and four or five kinds of palms grouped in infinite variety, and accompanied by herbs, vines and shrubs. The depressions in the rock which composes the structure of the islands were either filled with masses of the saw

FIG. 31. A palm barren on Cudjoe Key. These prairie like expanses are mainly covered by a carpet of grasses and sedges, and showy-flowered herbs. There are occasional shrubs, but the conspicuous vegetation is composed of palms. The cabbage palm and the thatch palm predominate. A small clump of the saw palmetto may be seen in the center of the picture. The arboreous palms in this landscape are all cabbage palms.

palmetto or with saw-grass, the latter forming miniature Everglades. Not only do we find the vegetation different from that of the upper keys and related to that of the mainland, but the animals characteristic of the mainland, such as the deer, the

wildcat, the alligator and rattlesnake are there. This fact is still more interesting when we take into account the fact that many of the upper keys are relatively close to the mainland and some of them were formerly almost connected with it, while the lower keys are not only cut off from the upper ones by the wide Bahia Honda channel but are separated from the mainland by an unbroken expanse of water forty miles wide or more. On the keys where the pine is absent palms predominate and aside from the coastal hammocks they often represent the sole arboreous vegetation. The several kinds grow either intermingled or in pure groves, and on the prairie-like expanses they present a unique landscape.

Although vegetation on these keys, and elsewhere had not recovered from the effects of the hurricane referred to, and being still further reduced by a prolonged drought we secured over four hundred field numbers and about two thousand specimens of the rarer and more interesting species of plants. Big Pine Key yielded a Bahamian shrub new to our flora. A thorough investigation of these keys at both the beginning and end of the rainy season would doubtless yield surprising results, for previous collecting on them has evidently been largely or wholly confined to the coastal hammocks. Our discovery of acres of the saw palmetto on all of the keys visited and of immense groves of the cabbage palmetto on several of the keys is a strong indication as to the superficial method of collecting done there before, for the existence of these conspicuous plants off the Florida mainland had not been previously suspected, except for a report of the occurrence of the cabbage palmetto on Key Largo.

Respectfully submitted,

J. K. SMALL,

Head Curator of the Museums and Herbarium.

THE RHODODENDRON BANKS.

A little over a year ago a carload of about 800 rhododendron plants was imported from the mountains of North Carolina. These were used mainly in forming decorative plantations in the neighborhood of the West Lake north of the museum. On the steep bank at the southwest corner of this lake a group of *Rhodo-*

FIG. 32. Rhodendron banks bordering the West Lake, north of the museum.

dendron punctatum was placed. The pink blossoms of this plant gave a charming touch of color in May; this early blooming habit makes it especially desirable.

The steep bank of this lake, on each side of the bridge, and the nearby triangle formed by the paths, were planted with *Rhodo-dendron maximum* and *R. catawbiense*, the former to the north of the bridge, the latter to the south, while in the triangle plants of both were placed. The accompanying illustration is from a

photograph made of this bank early in June, when *Rhododendron catawbiense* was in full bloom. The blossoms varied from a pale pink to deep rose, the latter color predominating. As this species wanes toward the middle of June, or a little later, *Rhododendron maximum* begins to show its flowers, usually of a paler color, reaching its maximum of flowers toward the end of June or early in July. With these three native species it is possible therefore to have flowers continuously from May to July.

After flowering the plants present a beautiful mass of green to which color may be added by means of lilies. For this purpose some of the taller growing sorts should be selected, and if this is carefully done a succession of these flowers may be had from late in June to the time of frost, the dark green of the rhododendrons forming an effective back-ground for the flowers. For June *Lilium candidum*, the Madonna lily, with its pure white flowers, may be selected, or the orange-flowered *Lilium maculatum*, with its darker spotting, a stately and dignified lily. For July *Lilium auratum*, the Japanese golden-banded lily, is excellent, as is also our own native meadow lily, *Lilium canadense*. For August the Turk's-cap lily, *Lilium superbum*, and the tiger-lily, *Lilium tigrinum* are suggested; and for the latter part of this month, and carrying on into September, *Lilium speciosum* is available.

A word as to the planting of these rhododendrons. Good top-soil, with well-rotted manure, was used for filling in around the plants. At the completion of planting about six inches of leaf-mould was placed over the entire plantation, this forming the best mulch and more nearly meeting the natural requirements of these plants. In the fall, just before the winter set in, an additional dressing of old leaves was added, a process which it is intended to repeat yearly, the necessary leaf-mould being thus continuously formed by the rotting of the leaves. During the extended drought of last summer the plants were watered once or twice each week. The result of this treatment has been entirely satisfactory, not over a dozen plants dying during the past winter, which has been especially destructive not only to rhododendrons, but also to other evergreen trees and shrubs.

GEORGE V. NASH.

CONFERENCE NOTES.

The last of the spring conferences was held in the library on May 3, Dr. W. A. Murrill presiding. The meeting consisted mainly of informal reports by various members of the staff and students.

Mr. Fred J. Seaver showed specimens of two fungi (*Neopeckia Coulteri* and *Herpotrichia nigra?*) which occur as parasites on various coniferous trees at high altitudes in the Rocky Mountains. The two fungi are so much alike that they can be distinguished only by microscopic examination of the spores and for this reason the species have been hopelessly confused and most of the specimens in our collections are incorrectly named. So far as our observations have gone the one species (*Neopeckia Coulteri*) occurs only on species of pine, while the other (*Herpotrichia nigra?*) occurs on spruces and firs but never, so far as observed, in America on pine.

Herpotrichia nigra was originally described in Europe and has been reported on both spruces and pines as well as on other coniferous trees. Examination of various European specimens of this species shows the spores to be much smaller than those examined in American specimens. Whether this difference in size which is very marked is due to the fact that the spores are immature is uncertain. Attempts to secure specimens of type material in order to determine the identity of the European species have so far been unsuccessful.

The fact that this European species occurs on both spruces and pines while the American specimens which are thought to be identical does not occur on pine and that this difference in habitat is accompanied by a difference in the size of the spores suggests the possibility that the American specimens may constitute a species distinct from the European.

The pine inhabiting species of America (*Neopeckia Counteri*) which is very different from the preceding species in spore characters is unknown to Europe. The results of these studies will appear more in detail in a paper to be published later.

Dr. F. D. Kern gave an interesting account of a recent visit

to Newfield, New Jersey, the former home of Mr. J. B. Ellis, whose extensive collections of fungi were several years ago added to the Garden collections.

The object of this trip was to collect more material of certain species of plant rusts which were described several years ago from material collected near Newfield. By following the directions on the packets of these fungi in the Ellis collection, he was able to accomplish the object of his trip. A point brought out by Dr. Kern was the value of indicating carefully the type locality of new species of fungi as a guide for collectors who might want to duplicate these collections in later years.

Dr. M. A. Howe commented on the death of Olsson-Seffer, an account of which appeared in the JOURNAL for May.

Briefer notes were made by Drs. W. A. Murrill and C. A. Darling and Mr. B. O. Dodge.

FRED J. SEAVER.

JOHN J. CROOKE

Mr. John J. Crooke, a member of the New York Botanical Garden Corporation since 1896 died at his residence, Great Hills, Staten Island, on April 22, 1911, in the eighty-eighth year of his age.

Throughout his long life Mr. Crooke was devoted to all phases of natural and physical science. His collegiate education was at Yale, under Professor Benjamin Silliman. He was an intimate friend of Professor John Torrey and of Professor John S. Newberry, of Columbia, and his acquaintances included most of the prominent American men of science of the latter half of the nineteenth century. His investigational work was mostly in the domains of chemistry, physics and metallurgy, but he accumulated large and important collections of shells, birds, minerals and plants, and built a house to contain them on his Staten Island estate, which also contained at one time a fine working natural science library, since distributed. Some years ago, he presented the American Museum of Natural History with his shells and

minerals; the collection of the shells of land snails was especially noteworthy and is an important part of the Museum's scientific equipment; he subsequently presented the New York Botanical Garden with a considerable part of his herbarium. Prior to these gifts, at about the time of Dr. Torrey's death in 1873, Mr. Crooke presented Columbia College with the valuable general herbarium formed by the Swiss Professor Meisner, and with an herbarium illustrating the flora of the southeastern United States prepared by Dr. A. W. Chapman, of Apalachicola; these are incorporated in the general herbarium of Columbia College deposited at the New York Botanical Garden.

The natural history collections accumulated by Mr. Crooke were mainly brought together by purchase; he did not collect extensively himself, although, during his long residence at Colorado, while developing his mining interests there, some specimens, especially minerals, were personally obtained by him. He made important discoveries and original observations in chemistry, physics and metallurgy, resulting in new technical processes of manufacture, many of which were patented. He was a charter member of the Torrey Botanical Club, and in the early days of that organization, aided its work materially. The writer has been favored with Mr. Crooke's intimate acquaintance since boyhood and his direction to lines of scientific inquiry was induced by this companionship and suggestion.

In botany, Mr. Crooke is commemorated by the genus *Crookea*, of the St. John's-wort Family, native of the southeastern United States, dedicated to him by Dr. John K. Small in 1903.

N. L. Britton.

SUMMER LECTURES, 1911.

Lectures will be delivered in the Lecture Hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at four o'clock, as follows:

July 1, "Wild Flowers of Summer," by Dr. N. L. Britton.

July 8, "Swedish Botanical Gardens," by Dr. W. A. Murrill.

July 15, "Plant Diseases and their Control," by Mr. Fred J. Seaver.

July 22, "The Uses of the Cacti," by Dr. H. H. Rusby.

July 29, "Plants as Insect-traps," by Dr. John H. Barnhart.

Aug. 5, "The Vegetation of the Dismal Swamp of Virginia," by Dr. Arthur Hollick.

Aug. 12, "The Paris Botanical Garden," by Dr. W. A. Murrill.

Aug. 19, "A Visit to the Panama Canal Zone," by Dr. Marshall A. Howe.

Aug. 26, "Evergreens: Their Uses in the Landscape," by Mr. George V. Nash.

The lectures, which occupy an hour, will be illustrated by lantern slides and otherwise. The doors will be closed at 4:00, and opened again at 4:15 to admit those arriving late.

The Museum Building is reached by the Harlem Division of the New York Central and Hudson River Railway to Botanical Garden Station, by trolley cars to Bedford Park, or by the Third Avenue Elevated Railway to Botanical Garden, Bronx Park. Visitors coming by the subway change to the Elevated Railway at 149th Street and Third Avenue.

NOTES, NEWS AND COMMENT.

Dr. F. E. Clements, professor of botany in the University of Minnesota, accompanied by Mrs. Clements, were visitors at the Garden on June 17.

Dr. W. A. Murrill, assistant director, spent May 5 and 6 at Albany consulting types of fungi in the State Museum.

Dr. R. A. Harper, professor of botany in the University of Wisconsin, was a recent visitor at the Garden.

Dr. Chas. H. Thom, of the Connecticut Agricultural Experiment Station, recently spent several days at the Garden consulting literature pertaining to his work on certain groups of the lower fungi.

Mr. Edward C. Johnson, pathologist in charge of cereal disease work, Bureau of Plant Industry, Washington, D. C., spent a

part of the day, June 20, looking over smuts and rusts in the Garden collections.

Dr. W. C. Coker, professor of botany in the University of North Carolina, spent several days at the Garden in June, in continuation of his work on the flora of North Carolina.

Mr. W. H. Rankin, fellow in Plant Pathology at Cornell University, made his headquarters at the Garden during most of May, while beginning an investigation of the chestnut canker with special reference to its control in New York state.

Volume 25, part 3, of North American Flora, containing Rutaceae and Surianaceae by Mr. Percy Wilson, Simaroubaceae by Dr. J. K. Small and Burseraceae by Dr. J. N. Rose, was issued May 6, 1911.

Owing to the dry weather in May, the plane-trees entirely escaped the blight (*Gloeosporium nervisequum*) which has attacked them severely during the last three seasons.

The Municipal Engineers of the City of New York made a visit of inspection to the New York Botanical Garden on the afternoon of Saturday, June 17. At two o'clock, an illustrated lecture on "The Protection of Shade Trees" was given by Dr. W. A. Murrill in the lecture hall of the museum building, and the remainder of the afternoon was devoted to the inspection of the buildings and grounds under the guidance of members of the Garden staff.

Mr. Lowell M. Palmer has recently presented to the Garden a supplementary collection of evergreen trees from the nurseries of his estate at Stamford, Conn., including some six hundred plants, mostly of small size, which have been placed in the nurseries of the Garden. It has been through Mr. Palmer's previous liberality, through gifts of conifers, that the collections already planted out, surrounding conservatory range no. 1, have been secured, and the present gift will increase the representation of these trees materially. The present spring has been unsuitable for the planting out of trees and shrubs, owing to the drought which continued through May.

Dr. Arthur Hollick, curator, returned on May 17 from a six months' leave of absence granted for the purpose of studying

and reporting upon the fossil flora of Alaska, for the United States Geological Survey. The work was prosecuted at the U. S. National Museum. A paper entitled "Results of a Preliminary Study of the So-called Kenai Flora of Alaska," based upon the above mentioned investigation was read at the Pittsburgh meeting of the Paleontological Society of America and subsequently printed in the American Journal of Science **31**: 327–330, April, 1911. The bulk of the material studied was collected by Dr. Hollick during his trip down the Yukon valley in 1903.

Dr. Marshall A. Howe, curator, represented the Garden at the sixth annual meeting of the American Association of Museums, held in Boston and vicinity, May 23–27. About one hundred delegates from the principal museums of the United States were in attendance. Meetings for the reading and discussion of papers and for the transaction of business were held in Boston at the Museum of Fine Arts and at the Museum of the Boston Society of Natural History; in Cambridge, at the Fogg Museum of Art of Harvard University; and in Salem, at the Peabody Museum. Visits were made to the Museum of the Harvard Medical School, to the Arnold Arboretum, and to various other museums of Harvard University. Parties were also organized to visit the museums at Worcester, Andover, and Lancaster. The American Association of Museums, though now only five years of age, is exerting an important influence in developing, perfecting, and popularizing the educational and research work of the American museums.

Meteorology for May.—The total precipitation for the month was 1.31 inches. Maximum temperatures were recorded of 82° on the 7th, 86.5° on the 10th, 85° on the 18th, and 86° on the 22d. Also minimum temperatures were recorded of 32° on the 4th, 41° on the 15th, 52.5° on the 16th, and 51° on the 24th.

Meteorology for June.—The total precipitation for the month was 4.94 inches. Maximum temperatures were recorded of 85° on the 2d, 90° on the 10th, and 91° on the 20th, and 28th. Also minimum temperatures were recorded of 51° on the 4th, 55° on the 6th, 50° on the 17th, and 54.5° on the 22d.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

122 specimens of flowering plants from Pennsylvania, New Jersey and Kentucky. (By exchange with the British Museum.)

3 specimens of fungi from North America. (Given by Mr. Fred. A. Wolf.)

1 specimen of *Wolffiella floridana* from North Carolina. (Given by Mr. Bayard Long.)

2 specimens of *Monotropsis* from Alabama. (Given by Professor Wolfgang Wolf.)

2 specimens of *Amphoridium caespitosum* from British Columbia. (By exchange with Professor John Macoun.)

22 specimens of exotic mosses. (By exchange with Professor V. F. Brotherus.)

1 specimen of *Adelia segregata* from Florida. (By exchange with the United States Forest Service.)

1 specimen of tubers of *Apios Apios* from the Dismal Swamp, Virginia. (Given by Dr. Arthur Hollick.)

18 specimens of Cretaceous fossil plants from Wyoming. (Collected by Mr. Charles H. Sternberg.)

1 specimen of fossil plant from Montana. (Given by Dr. W. D. Matthew.)

8 specimens of plants from Florida. (By exchange with Dr. John W. Harshberger.)

1 specimen of *Ceratodon purpureus* from Pennsylvania. (By exchange with Professor A. F. K. Krout.)

200 specimens "North American Uredinales." (Distributed by Mr. Elam Bartholomew.)

1 specimen of *Mnium serratum* from Washington. (By exchange with Professor T. C. Frye.)

1,800 specimens from Cuba. (Collected by Dr. N. L. Britton, Mrs. N. L. Britton and Mr. J. F. Cowell.)

1 specimen of *Dicranum* from New Brunswick. (Given by Mrs. Elizabeth M. Dunham.)

3 specimens of polypores from North America. (By exchange with Mr. Elam Bartholomew.)

2,000 specimens of fungi (rusts). (Distributed by Professor Paul Sydow.)

12 specimens of polypores from Ohio. (By exchange with Mr. L. O. Overhots.)

PLANTS AND SEEDS.

10 cacti from New Mexico. (Collected by Mr. W. W. Eggleston.)

21 cacti for conservatories. (By exchange with National Museum, through Dr. J. N. Rose.)

4 plants of *Aristolochia Gigas Sturtevantii*. (By exchange with Buffalo Botanic Garden.)

23 violet plants. (Given by Prof. Ezra Brainerd.)

9 violet plants. (Given by Miss E. M. Kittredge.)

2 plants of *Villaria* from New Providence. (Given by Miss Rafaela Brace.)

8 plants for conservatories. (Given by Mr. John Lewis Childs.)

17 plants of *Sequoia gigantea*. (Given by Mr. A. T. White.)
8 *Pelargonium* plants. (Given by Mrs. F. A. Constable.)
7 plants of *Tulipa sylvestris*. (Given by General T. E. Wilcox.)
23 herbaceous plants. (By exchange with the Brooklyn Botanic Garden.)
1,400 cactus plants, from Lower California. (Collected by Dr. J. N. Rose.)
1,407 hardy plants. (Purchased.)
817 plants derived from seeds from various sources.
1 packet seed. (Given by Dr. H. H. Rusby.)
63 packets seeds. (By exchange with Botanic Garden, Oxford, England.)
1 packet seed of *Musa Ensete*. (By exchange with Public Gardens, Jamaica, W. I.)
1 packet of seed of *Pithecoctenium hexagonum*. (By exchange with Public Gardens, Jamaica, W. I.)
2 packets seed of *Burragia*. (Collected by Dr. J. N. Rose.)

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REPORT ON CUBAN EXPLORATION.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: In accordance with your instructions, I sailed from New York City December 3, 1910, and spent three weeks in the provinces of Havana and Pinar del Rio in making a collection of botanical specimens for the Garden.

Upon my arrival at Havana on the morning of December 7, I was met by Brother León, of the Colegio de la Salle at Vedado, who had made arrangements to accompany me during my three days' stay in that province.

December 8 was given to exploration in the coastal region between Morro Castle and Cojimar. Here, however, owing to a severe drought and an unfavorable season, few plants were in flower or fruit.

Of the shrubs, one of the most common is a species of *Zanthoxylum* (*Z. taediosum*), a relative of the "Hercules-club" of the Bahamas, and originally described from specimens collected in the vicinity of Cabaña. In sandy places back from the coast, this species often attains a height of five or six feet, but growing as it sometimes does on exposed littoral rocks it becomes dwarfed and prostrate.

Several species of *Lantana* were frequently met with, occasionally growing together, and conspicuous on account of their brilliant red, orange, or white flowers.

The spurge family was represented in the coastal sands by several small, prostrate species of *Chamaesyce*, and in the thickets

near Cojimar by a species of *Omphalea* (*O. trichotoma*), with its much dissected or entire leaves. Many individuals were examined, but all proved to be barren. The Garden collection, however, contains excellent flowering and fruiting specimens obtained here during the spring of 1910.

The hillsides of Monte La Noria, and thickets along the Cojimar River were visited the following day and specimens of many plants not represented in the coastal flora were obtained. Large shrubs of *Anastraphia* (*A. ilicifolia*), of the thistle family are to be found on some of the steep cliffs, while in dense shade on a rocky hillside, a large clump of *Brunfelsia* with showy purple blossoms was in flower.

The banks of the Rio Almendares from Puentes Grandes to the seacoast were examined on December 10, and a number of interesting additions to the collection were made.

Sailing in the evening on the S. S. "Julian Alonso" I arrived at Bahia Honda at 4:30 the following morning. As it was Sunday and there was no available means at this early hour to transfer my baggage from the landing to the town, a distance of about one and a half miles, I was obliged to carry several of the large packages containing plants in driers, and await the delivery of the remainder of my outfit.

Accommodations at Bahia Honda were rather undesirable, but through chance acquaintance with Mr. John G. Keyser, I arranged to make headquarters at his residence on "Buenaventura," a large citrus plantation about two miles from town, where I remained from December 12 to 20, and greatly enjoyed his kind hospitality.

Two days collections were made along Camino Aguacate, where my work was greatly facilitated by the kind suggestions of Mr. and Mrs. William Price, American residents, to whom I had a letter of introduction from Mr. Ernest W. Halsted, a former associate at the Cuban Agricultural Station at Santiago de las Vegas.

Royal palms are everywhere in abundance and form a striking feature in the landscape. Several specimens with bulging trunks much resembling the "palma baragona" of the savanna regions

of Pinar del Rio were seen. Along some of the streams, large areas are forested with a dense growth of "poma rosa" (*Eugenia Jambos*), to the exclusion of native species, while near the trail, trees of the alligator pear and mango were prominent.

The extensive shore line of Bahia Honda was examined with the aid of a schooner, but here the flora proved rather uninteresting, as a large mangrove swamp extends for a considerable distance, and the plants collected are mostly those of similar environments on other West Indian islands.

While at "Buenaventura," under guidance of a native, I visited several streams, along the largest of which, the Rio San Miguel, two days were devoted to collecting. Here, however, owing to uprooted trees and tangled underbrush, the work of a recent cyclone, our progress was greatly retarded, and we were often obliged to follow the bed of the river, sometimes in water waist deep, in order to reach wilder and less frequented parts. A shrubby aster was found on the rocks in the bed of the river in the vicinity of Mal Paso, and excellent herbarium specimens of it were prepared, together with other endemic plants.

The rocky hillsides directly back of Bahia Honda are covered with a low, dense growth of shrubbery, and being of a different formation, bear for the most part species absent in the coastal floras or on the fertile hillsides.

As the steamer plying between Havana, Bahia Honda, and other ports along the northwest coast, makes but two trips each month, I returned to Havana early on the morning of December 22. Again having the kind coöperation of Brother León, we explored the region, for a mile or so, between Cojimar and Playa de Bacuranao. A short distance back from the coast, we discovered a single plant of *Cereus nudiflorus*, originally described from specimens collected in the vicinity of Havana. This cactus, sometimes attainting tree-like dimensions, may formerly have been well represented in the coastal flora about here, but at the present day it is certainly rare, as it was not noticed at any other points we visited.

Parts of two days were spent in the thickets between the Rio Almendares and Playa de Marianao, where the flora is more varied than in the country about Cojimar.

On December 27, I went by automobile stage to Santiago de las Vegas to visit Laguna de Castellano, which at some seasons waters a considerable area, and contains many aquatics, and the following day by rail to Laguna Ariguanabo, where the lotus (*Nelumbium luteum*), of which we found only decaying leaves and stems, is said to be abundant and very attractive during the summer months. A yellow-flowered bladder-wort (*Utricularia foliosa*), was plentiful in shallow water, while species of *Castalia*, *Nymphaea*, and *Nymphaeoides* were also found.

The collection aggregates considerably over 1,000 specimens and includes many plants of interest.

For many courtesies I am greatly indebted to Mr. Wilhelm Lange, Mr. F. L. Page and Mr. William M. Price, of "Buenaventura."

Sailing from Havana on December 31, I arrived in New York January 3, 1911.

Respectfully submitted,

PERCY WILSON,

Assistant Curator.

IMPROVEMENTS ALONG THE WESTERN BOUNDARY OF THE GARDEN.

Pursuant to Chapter 558 of the Laws of the State of New York for 1909, and to the provisions of an agreement authorized by this legislation made in 1910 by the city of New York, the New York and Harlem Railroad Company, the New York Central and Hudson River Railroad Company and the New York Botanical Garden, the telegraph and telephone wires and their supporting poles which have stood for a number of years along the western side of the Garden have recently been entirely removed, and the wires placed in a subterranean conduit, thus relieving this side of the Garden of an unsightly feature.

Some of the poles stood on land of the Garden and others on the land of the railroad companies. The wires were interfering with the growth of trees planted for a border-screen along the

boundary, and the poles, which were set inside Bronx Park a number of years ago, were found to be here without authorization.

The new conduit containing the wires was constructed partly on the right of way of the railroad companies and partly just inside the Garden, in accordance with detailed plans approved by all parties concerned, and buried deep enough to permit the planting of trees and shrubs over it, where desired. Access to the wires is attained by man-holes at suitable distances apart. The conduit was very carefully located in relation to standing trees, so that none of any value in the border-screen were affected. In the early autumn of 1910, a number of shrubs were removed from the line and planted elsewhere; these may be replaced during the coming October.

The agreement also contained a provision for the construction of a fence by the railroad companies along the boundary, extending the entire distance from the Elevated Railroad Station on the south to the northwestern corner of the Garden land, without expense either to the city or to the Garden. This fence was built during the spring; it is of iron with concrete posts, and is a very neat and effective barrier.

All this construction work was carried out by the railroad companies in a very careful manner, so that no harm was done to any part of the grounds or to the trees, and all surplus material was cleaned up and disposed of as directed. It is a matter of congratulation to all concerned that this useful piece of work has been so speedily and satisfactorily accomplished.

N. L. Britton.

THE FLOWER EXHIBITION.

An exhibition of plants and flowers was held on July 1st and 2d, in the fossil hall in the basement of the museum, by The Horticultural Society of New York, in coöperation with the Garden. A similar exhibition was held in June, one will occur on August 26th, devoted mainly to gladioluses, and another will be held in September.

At the July exhibition the main features were Japanese irises, outdoor roses, and flowers of herbs, shrubs and trees. It was the first flower exhibition held in July, and the outcome was uncertain. It was a success, both halls being filled with flowers.

The first prize for a collection of outdoor roses was awarded to Scott Brothers, who also received first for twelve vases of Japanese irises, the second prize going to Mrs. F. A. Constable. Mr. H. Darlington received first and Mrs. A. M. Booth second prize for a collection of six vases of sweet peas. The first prize for a vase of one hundred sprays of sweet peas went to Mr. Darlington and the second to Mrs. Booth. Mrs. F. A. Constable and Mr. T. A. Havemeyer took prizes for collections of herbaceous flowers, the former first prize and the latter second. Mr. Havemeyer also took first prizes for a collection of flowers of shrubs and trees, and for six vases of Japanese irises. Three vases of sweet peas brought the first prize to Mr. Darlington in that class, the second to Mr. Havemeyer.

For a collection of three vases of sweet peas, three varieties in each vase, a special prize was awarded to Mrs. A. M. Booth, Mr. Havemeyer also receiving a special prize for a collection of sweet peas. A beautiful vase of the madonna lily, *Lilium candidum*, was exhibited by Mrs. Constable, to whom a special prize was awarded. Mr. L. S. Livingston exhibited a vase of cut blooms of *Romneya Coulteri*, a plant rare in cultivation and of difficult culture. Mr. Livingston has had great success in the cultivation of this plant. Special mention was given to this exhibit by the judges.

GEORGE V. NASH.

NOTES, NEWS AND COMMENT.

Dr. R. A. Harper arrived in New York August 4, to assume the duties of Torrey Professor of Botany in Columbia University.

Dr. Lester F. Ward visited the Garden in July and spent an afternoon inspecting the conservatories, propagating houses and nurseries.

Dr. N. L. Britton, accompanied by Mrs. Britton, sailed August 9, for a month's residence at the Royal Gardens, Kew, England, in continuation of their studies on the flora of the West Indies.

Miss Lewanna Wilkins, of Washington, spent a part of the month of July at the Garden in continuation of her work on Solanaceae.

Dr. Bruce Fink, professor of botany in Miami University, Oxford, Ohio, arrived at the Garden August 10 for a month's residence, in the prosecution of his researches on North American lichens.

Dr. Gertrude S. Burlingham spent a part of the summer near West Wardsboro, Vermont, collecting fungi in connection with her work on a monograph of the genus *Russula* for North American Flora.

Miss Winifred J. Robinson, instructor in botany at Vassar College, has been residing at the Garden during the past month, continuing her work on Hawaiian ferns.

Miss Martha Kennerly, instructor in biology in Normal College High School, New York, has been engaged in the study of mosses at the Garden during the past month.

Dr. Howard J. Banker, professor of biology in DePauw University, Greencastle, Indiana, spent several days at the Garden in July looking over literature on the fungi.

Dr. Albert LeRoy Andrews, of Cornell University, spent the month of July at the Garden as research scholar. He has completed his manuscript of the genus *Sphagnum* for North American Flora and has recently been engaged in the study of Weisiaceae. A part of the time has been spent in the pine barrens of New Jersey in search of the fruit of various species of *Sphagnum*.

At public conservatory range no. 2, on the eastern side of the grounds, the additional houses constructed during the past year under a Park Department contract with John R. Sheehan & Company were completed and opened to the public on July 3. The

collection of tropical exogenous plants heretofore installed in houses 7 and 8 of conservatory range no. 1 were moved into the larger of the two new structures at conservatory range no. 2, without incident. This collection, in its present home, can be seen to much better advantage than before, and it can also be better cultivated, on account of the greenhouse benches being lower and the plants more readily accessible. Advantage is being taken of the opportunity to paint the interior of houses 7 and 8 of range no. 1 while they are empty. In the autumn, the collections of cacti, which at present are nearly all out-of-doors, will be brought into these houses 7 and 8, and a much more comprehensive display of these plants will be effected by bringing there several hundred specimens hitherto grown only at the propagating houses.

Meteorology for July.—The total precipitation recorded at the Garden for the month was 1.96 inches. Maximum temperatures were recorded of 100° on the 2d, 104.5° on the 3d, 102.5° on the 11th, and 89° on the 18th. Also minimum temperatures were recorded of 58.5° on the 15th, 56° on the 19th, and 54° on the 26th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

11 specimens of fungi from southern California. (Given by Professor C. F. Baker.)

1 specimen of *Pithecoctenium hexagonum* from Hope Gardens, Jamaica, West Indies. (Given by Mr. William Harris.)

1 photograph of *Illicium floridanum* from Alabama. (Given by Dr. R. M. Harper.)

15 specimens of mosses from California. (By exchange with Mr. C. C. Kingman.)

51 specimens for the local herbarium. (By exchange with the United States National Museum.)

1 specimen of *Leskea algarvica* from Portugal. (By exchange with Mr. H. N. Dixon.)

4 specimens of mosses from America and Europe. (By exchange with Mr. Jules Cardot.)

1 specimen of *Gustavia superba* from Jamaica, West Indies. (Given by Mr. William Harris.)

1 specimen of *Juglans* from China. (Given by Mr. C. W. Beebe.)

4 specimens of mosses from California. (Given by Mr. George M. Pendleton.)

59 specimens of mosses from Mexico. (Distributed by Mr. T. S. Brandegee.)

1 specimen of *Andreaea obovata* from Norway. (By exchange with Dr. Niels Bryhn.)

1 specimen of *Tortula mucronifolia* from Connecticut. (Given by Miss Annie Lorenz.)

4 specimens of mosses from Salisbury, Connecticut. (By exchange with Dr. George E. Nichols.)

39 specimens of flowering plants from the Chesapeake Bay region. (By exchange with the United States National Museum.)

6 specimens of flowering plants from South Carolina. (Given by Professor W. C. Coker.)

2 specimens of violets from the New York Botanical Garden. (Collected by Dr. N. L. Britton.)

11 specimens of violets. (Given by Professor Ezra Brainerd.)

20 specimens of marine algae from the Philippines. (By exchange with Mr. E. D. Merrill.)

24 specimens of marine algae from Mexico. (By exchange with the Department of Biological Exploration, Mexico.)

1 specimen of fungus from Mexico. (Given by Professor T. D. A. Cockerell.)

2 specimens of *Rubus phoenicolasius* from Lancaster County, Pennsylvania. (Given by Mr. J. J. Carter.)

PLANTS AND SEEDS.

24 plants for conservatories. (By exchange with Mr. Frank Weinberg.)

3 plants for the conservatories. (Given by Mr. Herman Lionarons.)

14 cactus plants from Utah. (Collected by Dr. P. A. Rydberg.)

64 plants for the conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)

1 packet seed of *Juglans* sp. from northern China. (Given by Mr. C. W. Beebe.

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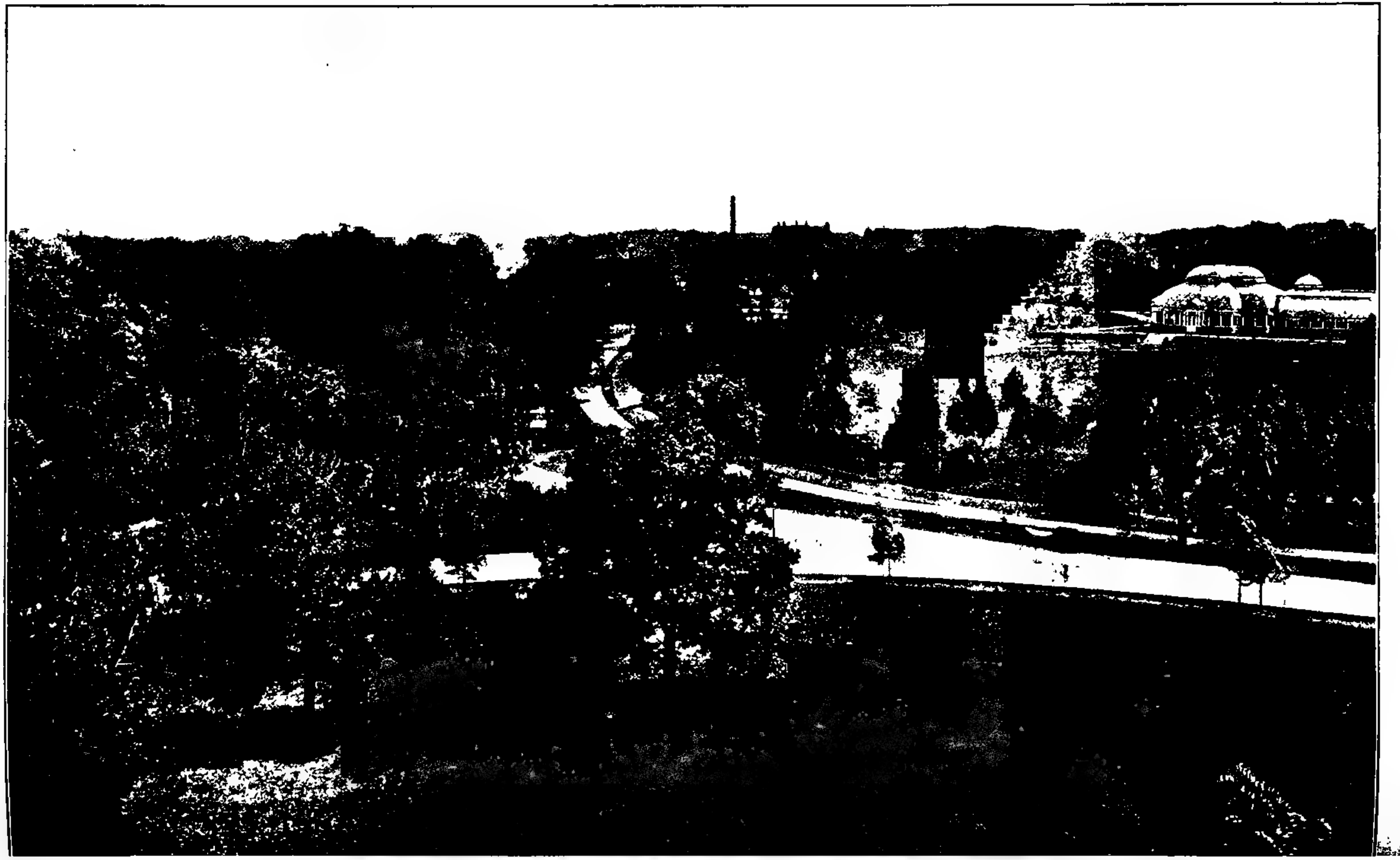

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THE USES OF THE CACTUSES.*

The Cactaceae do not comprise a very large family, yet its members present a great variety, and constitute a very important feature in the world's vegetation and landscapes.

About 40 genera and 1,000 species are known. This audience is peculiarly favored by being privileged to see, in the greenhouses and grounds of this Garden, what is undoubtedly the largest and most representative collection of these plants that has ever been brought together, more than 600 species being included.

Cactuses are confined almost wholly to dry regions. In nearly all cases, these regions have a distinct rainy season, although it is sometimes very short indeed. During this rainy season, the plant lays in a supply of water sufficient to last it during the dry season that follows. For the performance of this function, the cactus, like the camel among animals, is specially constructed, a certain portion of its cells being so changed in form and habit that they are capable of taking in and holding securely a large amount of water. Tissue consisting of this sort of cell is called water storage tissue. Sometimes there is only a thin layer of this tissue under the surface of the stem, while at others, a large part of the plant body is capable of holding water, although not all of such tissue is of this peculiar kind. The promptness with which the plant gorges itself with water as soon as the rains commence can be demonstrated by taking measurements of its

*Lecture delivered at the New York Botanical Garden, July 22,1911.

girth at intervals of a few hours, when the rapidity of the process will remind one of absorption by a piece of sponge.

It must be mentioned, however, that there are some cactuses which actually live in moist forests and thrive in a humid atmosphere. Many of these moist-climate species, if not most of them, are epiphytic, growing on the trunks or branches of trees. Owing chiefly to the peculiar life-habits mentioned, the cactuses have developed peculiar forms, which, though differing among themselves, constitute a characteristic class. The most important of these structural changes is the assumption by the stem of various massive forms, composed largely of soft tissue. Next in importance and conspicuousness is the loss of the leaves, and a corresponding modification of the outer bark, by which it assumes the duties which originally pertained to the leaves. It is evident that the evaporation from ordinary leaves, in the torrid atmosphere of the desert, would quickly result in the loss of stored water—long before the new annual supply became available; thus, under that law of life that declares that that which a plant or animal needs to enable it to successfully encounter the conditions of its environment, it shall secure, the cactus loses its leaves, at least as to their foliaceous form, and the epidermis of the stem is so modified as to assume wholly their duties, instead of merely aiding a little in their performance, as is customary among other plants. Their surface thus becomes smooth, green and leaf-like.

The leaves are not wholly lost, but are converted into spines, which often assume very strange and peculiar forms. That these changes are the result of environment, is evidenced by the fact that in various other families, especially the spurge or castor-oil family, almost exactly similar forms occur among the members which live under similar conditions.

The loss of moisture by evaporation is not the only danger to which plants of the desert are subjected. Their rich stores of water and of soft and digestible tissue, make them eagerly sought by foraging animals, against which they are protected by the formidable spines which I have described and illustrated. Some few possess no spines, having lost their leaves altogether. These

are, as a rule, poisonous, though there are believed to be some exceptions.

The protection gained by this spiny armature is increased and made more effective by the great readiness with which pieces of the stems take root and multiply, if broken off. In this way, they come to grow in vast, dense colonies, often to the exclusion of almost all other growth, and sometimes so densely as to entirely preclude travel among them by large animals.

Out of the peculiarities which I have mentioned, have developed quite a number of uses to which cactuses are put. First among such uses we will consider those which relate to the furnishing of drinking water for desert travelers in danger of perishing of thirst.

The fact that cattle, fed upon cactus pulp, require no other water supply, teaches the thirsting savage to chew and suck this pulp. When he can reach some one of the large barrel-cactuses, he employs a more elaborate method. The top of the stem is cut off and the soft inner pulp of the body is chopped and broken up, and then mashed with a pounder, and finally brought into such a state that it can be taken up and the water wrung out of it with the hands. It is said that in Mexico, a large cylindrical stem-section is sometimes removed, the cut ends sealed up, a hole bored in one side, the section placed over a fire with this hole uppermost, and the contained water driven off and condensed. A number of difficulties in this process suggest themselves, but it can scarcely be regarded as impossible.

The protective properties of the spines of cactuses are utilized in many ways. Cattle hedges are produced by merely dropping pieces of the stems in a row, where they quickly take root and form an impenetrable barrier. Stems of the organ-cactus are set in a row in the ground and grow into a living palisade, the stems a foot or more in diameter, and often twenty feet or more in height. Adobe walls surrounding gardens are surmounted with a growth of spiny cactus which is pretty apt to keep out marauding boys. Huts or kraalls are often built wholly or partly of cactus stems, and are an excellent protection against the inroads of wild beasts and serpents.

A strange mode of utilizing cactus spines is for the torture of prisoners by savages. It is reported that the Apache Indians, during the war of 1880, having captured some of their own people who had taken service with our Government as spies, gathered a pile of inflammable material, topped it with a mass of cactuses, threw the bound and naked captives upon the pile, where they were held fast by the great number of spines which penetrated deeply into the flesh, and in this position were burned.

The protection offered by the possession of poisonous properties is utilized by the Indians of northern Mexico in a peculiar way. The most poisonous members of the family are several species of *Lophophora*, or as they were formerly called, *Anhalonium*, natives of the region named. Most of the bodies of these plants are beneath the surface of the earth, only an inch or two of the top being aërial. These tops are cut off and dried, becoming greatly reduced in size and of a button-like form, so that they are popularly known as mezcal or muscal buttons. At certain times, the Indians gather for religious feasts and ceremonies, on which occasions they chew these buttons, swallowing the juice. A narcotic or delirifacient effect is produced, the subject going into a state of bodily paralysis, resembling sleep to an observer, but the mind being in a condition of trance, in which visions are seen and strange experiences are imagined. This procedure is thus in the same class as the use of opium or hashish by the orientals. If an excessive amount is taken, or if the individual is weak, the stupor which finally follows not infrequently results in death. These plants have been chemically analyzed and their narcotic properties have been found to reside in a series of powerfully poisonous alkaloids. Efforts have been made to utilize these alkaloids in medicine, but their field of usefulness has not yet been determined, and they are regarded rather as medical curiosities than as therapeutical agents.

Another poisonous species is the night-blooming cereus of the West Indies. The flowers, and to a less extent the stems of this plant have been utilized in medicine, as a heart tonic. Some chemists have extracted an alkaloidal principle, others equally competent and careful have failed to do so. Some physicians

find the medicine of great service, others equally reliable have found it inert, and the conclusion is unavoidable that the properties of the different lots of drug have varied, from some as yet undetermined cause.

An unimportant though interesting use of the cactus stem depends upon the peculiar manner in which its woody zone is constructed. Its wood does not form a continuous cylinder, as in the case of ordinary shrubs and trees, but consists of narrow bands which run spirally around the stem, in both directions, leaving lozenge-shaped openings at the intersections, these being occupied by a continuation of the soft tissue of the center, which connects the latter with that of the bark. In the young state these woody bands are small and the openings between them large, but with age the former gradually widen until at length the latter may be entirely eliminated, the woody zone becoming complete. Such stems, when of proper form and convenient size, are cleaned of their bark, the pith removed, the interstices cleaned out and the remaining skeleton then bleached or stained for use as an odd walking stick.

One of the uses of certain species of prickly pear cactus, formerly of vast importance, has been largely minimized by the discovery of the anilin dyes, namely, its use for the feeding and cultivation of the cochineal insect. Had it not been for the substitution of anilin for cochineal coloring, the demand for cochineal would by this time have been so great that enormous areas covered by cactus, and now practically useless, would have been required in the cochineal industry.

We now come to the more important uses of the Cactaceae, namely those relating to nutrition. It cannot be claimed that cactus pulp is a highly nutritious vegetable substance, but this fact by no means implies that its uses for food or fodder are unimportant. On the contrary, the conditions are such as to render the possible importance of these plants for fodder so great as to be almost beyond one's conception. It is well known that one of the greatest problems that now face political economists is that of finding some way of enlarging our meat supplies, so as to meet the increasing necessities of the human race. The pro-

duction of cattle in the United States by the old system of wide herd ranging is practically at an end. Development here must now take the form of intensive methods of cattle production, upon relatively small areas. It is the problem of land scarcity that now faces the grazing industry. In this emergency, we find millions of acres of land upon which the supply of ordinary forage plants is so small, and is found during such restricted portions of the year, that grazing cannot be profitably conducted there, but which support an amount of cactus vegetation capable of supplying an almost limitless supply of fodder, provided that a method can be found for using it. This one condition, were there no other, would render the utilization of cactus for fodder one of the most important to which governments could direct their attention, but there is another, the importance of which is not less. It has been found in feeding cactus to cattle, that they can subsist upon it without the addition of any other water supply, there being about 8 gallons of water per hundred pounds, and probably more in some species not yet tested, so that it at once provides a method of cattle production where there is no water supply. It is perhaps too much to say that the successful raising of cattle by means of an unsupported supply of cactus pulp, of the sort now available, is possible, but it can be affirmed that this supply is capable of preserving the lives of great herds during temporary periods of scarcity of fodder and water. There are furthermore good grounds for hoping that through the process of plant breeding and improvement by cultivation, the character of cactus fodder can be greatly improved as to its nutritive ratio and value, and that processes of separation and manufacture can be devised which will render it available for many uses not now practicable.

The results of the use of cactus fodder up to the present time indicate that its value, in kind as well as in amount, is almost the exact equivalent of that of green corn fodder, and that, in order to give the animal the fodder ratio required by the laws of nutrition, some richer fodder, as grain, must be fed with it. Fed in this way, and without any additional water supply, milk cattle were found to thrive without any apparent deterioriation. It

is furthermore worthy of note that the digestibility of grain and hay becomes greater with the addition of the cactus fodder.

It goes without saying that the spines existing upon these plants constitute a great obstacle to their successful use as fodder. The large spines, conspicuous to the eye, and rendering the plants so obviously formidable, are really of little importance when compared with the inconspicuous ones, which are not noticeable to the ordinary observer. I do not mean that these large spines are actually unimportant as to their injurious properties. They are extremely sharp and penetrate deeply when the least carelessness is manifested in handling the plants. Furthermore, there is in many cases a little cap at the tip which is detached and left behind in the flesh when the thorns are pulled out. Some of these caps possess their own poisonous properties, in addition to those which may exist upon them from the presence of ordinary atmospheric germs. The result is that they are capable of producing, and frequently do produce serious festering wounds and sometimes quite serious blood poisoning.

For every one of these larger spines, there are perhaps hundreds of a different kind, as fine as hair and only a small fraction of an inch in length. These are not borne singly as are the larger ones, but form little cushions, appearing like velvet to the eye, so densely massed they are, and penetrating the flesh in great numbers when these cushions are touched, even in the lightest manner. It is obvious that to feed cattle or sheep upon cactus fodder bearing this frightful armament would prove seriously injurious and, ultimately, probably fatal in most cases. The method that has prevailed in the ordinary use of cactus as a famine fodder, has been that of breaking off the larger spines and scorching off the finer ones, a process to which they yield instantly. A more important method is that of causing the plants to cease the production of the spines, by a process of plant selection and breeding. To this undertaking, Mr. Burbank, and to a less extent some others, have devoted great attention, and the results are quite promising.

Before taking up the important uses of the cactuses for human food, a few words may be said regarding their possible utilization as a source of sugar, alcohol and fiber.

The presence of fiber in plants so conspicuously juicy and pulpy is manifestly of relatively small importance. Nevertheless, there is great diversity among the different species and genera in this particular and it is, to say the least, not impossible that important uses for cactus fiber may yet be found. Moreover, should manufacturing processes finally be resorted to for the production of concentrated cactus foods, there will be, as a result, enormous quantities of fiber, as a by-product. While much of this would undoubtedly be used for fuel in the factory, it is very likely that considerable quantities would become available in the manufacture of paper pulp, the important chemicals required in this industry being obtainable in many of the regions where the cactuses grow.

The percentage of sugar in the cactus pulp is decidedly small, but when we reflect upon what has been done through selection and breeding to increase the percentage of sugar in the juice of the sugar cane, the sugar beet and especially the sorghum, we are justified in entertaining great hope for similar results in this family.

For the production of alcohol, it is not necessary to separate the sugar, but merely to ferment the mass and distill. In Mexico, and especially in Australia, an incredible amount of sugary cactus fruits go to waste annually which could easily be utilized in the production of spirit.

Coming now to the subject of the cactus as a human food, we note that even though it be not highly nutritious, it is fully equal in this respect to many of our vegetables used as relishes, and for adding to foods of other kinds. In Mexico, the young shoots or flattened joints of several cactuses, peeled and cleaned, are fried in fat as we fry egg-plant. Not only are they so palatable as to be used by the well-to-do, but they constitute a very cheap food for the masses. For one cent of Mexican money, equal to one half cent of ours, I have purchased enough of these "nopalitas" to furnish a breakfast for a small family.

Cactus pulp is preserved, as we preserve watermelon rind or citrons, and is also sold candied, like our glacé fruits. Cactus fruits are also candied in the same way and are among the most

delicious wares of the native confectioners. A ruder and cheaper, but yet excellent product is made by crushing the very ripe fruits, molding the paste into little cakes and thoroughly evaporating it, when it keeps well for a long time. Such cakes are quite sweet, though scarcely as sweet as figs, which they somewhat resemble in flavor. Since the number and variety of cactus fruits is very great, it will be seen that there is a wide range in sweetness and flavor among these products. Indeed, not all of them are sweet. I have purchased one variety in the market of Queretaro, in the dried condition, which was very sour and might form the basis of an excellent sauce or pie, similar to those from gooseberries or cranberries. These fruits were of green color and of the size of large gooseberries. The sale of cactus fruits, to be eaten in the fresh condition, constitutes a very important branch of industry in Mexico. Most of these fruits are classed as Tunas, and are produced by species of *Opuntia* or prickly pear. They vary in size from that of a small hen's-egg to that of a goose egg, and are of all shades of red, purple, crimson, yellow and green. Not only is this variety of color found upon the outside but throughout the pulp. Remembering that the cactus fruit is borne inside the end of a short branch, it may be inferred that they are very spiny on the surface. These spines must be carefully removed before they can be eaten. This is readily done by wiping them with a wisp of grass or a piece of paper, or they may be carefully peeled while held upon the end of a fork, like a hot potato. To the taste of most northern people, they are rather insipid and not very agreeable, but those brought up to their use find them quite as tasty as we do our staple fruits.

The Pitahaya, fruit of the giant species of *Cereus* and *Cereus*-allies, is quite different and requires separate treatment. It is nearly spherical, about as large as an egg, and of an exceedingly deep purple, internally and externally. It is much sweeter and of pleasanter flavor than the tunas, and is highly prized by all classes. It is not, however, merely its flavor that imparts the value, for the tiny seeds of which it largely consists are fatty and highly nutritious. The Indians, during the season, subsist largely upon this fruit and wax strong and fat.

Another fruit which requires special mention is the Garambulla, among the smallest of the edible cactus fruits, but growing upon one of the largest of its trees, *Myrtillocactus geometrizans* (Mart.) Console. This tree grows in the form of a candelabra, the crown consisting of a dense mass of erect, four- or five-angled branches, as thick as the arm or leg. The flowers and fruits occupy the edges of the angles, usually almost touching one another throughout. The fruits are as large as small gooseberries, and of an extremely deep purple. They bear the flower remains upon the tip and, unlike most other cactus fruits, are entirely smooth. They are collected sometimes by shaking, by waiting until they fall from their own ripeness, by scraping the angles with the end of a pole or, oftenest of all, by hand-picking. Thousands of bushels of them are sold annually in the market places in the fresh condition and other thousands are dried for winter use. They are sweet and delicious, of a flavor very hard to describe, that of a combination of various fruits, perhaps resembling the mulberry more than any other one fruit.

Altogether, while we cannot regard the Cactaceae as among the most useful of the families of plants, their aggregate importance must be rated as great and their possibilities even greater.

H. H. RUSBY.

MUSHROOM POISONING.

The recent epidemic of mushroom poisoning, during which about thirty persons lost their lives within a few weeks in the vicinity of New York City alone, was undoubtedly due to the prevalence of the white form of the deadly amanita, or "destroying angel," in the groves and woodlands of this region. After the heavy and continued rains of the last week in August, following a prolonged drought, mushrooms of many kinds sprang up in great quantity, the white form of the deadly amanita being conspicuous because of its color and large size, as well as because of its abundance.

The fatalities were mainly among the ignorant and foreign-born, who, to my personal knowledge, often collect everything

they find in the form of a fleshy mushroom as they scour a piece of woodland, at times leaving behind them the "cups" of the poisonous species imbedded in the soil. These same persons not only eat the specimens themselves, but also sell them to shop-keepers and share them with their friends. The white form of *Amanita phalloides*, especially when young and broken away from its swollen base, does not appear so very different to these collectors from the common field mushroom, *Agaricus campestris*, which is often pure white above and has its vivid pink gills hidden from sight by the veil in the younger stages. The two species are, however, very widely distinct, and persons incapable of distinguishing them would do well to abandon at once the rôle of mycophagist. The following descriptions indicate how different the two plants are:

COMMON MUSHROOM, *Agaricus campestris.*

Pileus 5–9 cm. broad, convex to expanded, dry, silky and whitish or floccose-squamulose and light reddish-brown, the color being chiefly in the scales; flesh white, thick, solid, of mild flavor, sometimes becoming reddish when broken; gills free, rounded behind, ventricose, crowded, white when young, becoming salmon-pink, and finally purplish-brown or blackish; spores ellipsoid, smooth, dark-brown, 10–12μ long; ring delicate, inconspicuous, formed from a thin, white veil, which covers the gills in their younger stages; stem smooth, white, cylindric, nearly equal, stuffed within, 3–6 cm. long, 1.5–2 cm. thick.

The common mushroom occurs in low grass on meadows or on rich, moist upland pastures, being common after rains from August to October in this latitude. The "spawn," or vegetative portion, is hidden in the soil and feeds upon the dead organic matter found therein. In the cultivation of this species, bricks of spawn are planted in suitable soil and the conditions of growth attended to with great care. This is the mushroom usually found in market, either in the fresh state or in cans. Most persons who collect fungi for food in the fields limit themselves to this one species.

DESTROYING ANGEL, *Amanita phalloides.*

Pileus convex to expanded, 5-15 cm. broad; surface smooth, glabrous, white, slightly viscid when moist; margin entire, con-

colorous; flesh white, not objectionable to the taste, although at times emitting a slightly disagreeable odor; gills white, not changing color, broad, rounded at the base, free from the stem; spores globose, smooth, hyaline, 7–8μ in diameter; stem long, slender, smooth, white, stuffed or hollow, 7–15 cm. long, 1–1.5 cm. thick, decorated above with a large white annulus and sheathed at the swollen base with a conspicuous white volva or "death-cup" 2.5–4 cm. in diameter.

The above description applies only to the white form. The species is common during summer and autumn in open groves and along the edges of woods. The most important part of the deadly amanita is the sheath at the base of the stem known as the "death-cup." This is what remains of the outer coat of the "egg" after the cap has burst from it and has been carried upward by the growing stem. The ring on the stem is somewhat similar to that of the common mushroom, but the gills are white, both when young and old, those of the common mushroom being at first pink, then black.

When gathering mushrooms, it is exceedingly important to get all of the stem and not leave a portion of it in the ground, since the "death-cup" may thus be overlooked. Mushrooms should not be gathered in the "button" stage unless mature specimens are growing in the same place, otherwise an "egg" of one of the poisonous kinds may be collected by mistake.

If distress is experienced within four or five hours after eating mushrooms, it is probably a case of indigestion or minor poisoning and should readily yield to a prompt emetic. If, however, from eight to twelve hours have elapsed since eating the mushrooms, disagreeable symptoms should be taken very seriously, since it is almost certain that one of the deadly narcotic poisons is at work. A physician should at once be called and the heart action stimulated by a hypodermic injection of about one sixtieth of a grain of atropine, which should be repeated twice at half hour intervals. Atropine is an antidote to the poison of the "fly amanita," which paralyzes the nerves controlling the action of the heart. If the "deadly amanita" has been eaten, the atropine will probably do no good, and death will surely follow if the amount eaten is sufficient.

For further information on this subject, the reader is referred to an article on local edible mushrooms in the JOURNAL for December, 1908; and to one on poisonous mushrooms in MYCOLOGIA for November, 1910.

W. A. MURRILL.

THE GLADIOLUS EXHIBITION.

The August exhibition of The Horticultural Society of New York was held in coöperation with the Garden on Saturday and Sunday, the 26th and 27th. The premiums offered were for gladioluses and water-lilies. Two large tables, fifty feet long, one in each of the central aisles of the fossil hall, were necessary for the exhibits, with three smaller supplementary tables to accommodate the overflow. The table in the west end of the hall, fully one half of the table in the east end, and part of the supplementary tables were devoted to gladioluses, so the preponderance of this popular flower was evident, making it primarily a gladiolus exhibit. Without seeing this large display, one could hardly realize that there were so many forms of this beautiful flower, all the colors of the rainbow being represented in many combinations.

There were other exhibits besides gladioluses. A collection of water-lilies, rich in color and fragrance, was one of the attractions. Mr. Wilbour S. Boyer, of Bedford Park, exhibited some peaches grown within a short distance of the Garden. Mr. John Lewis Childs, in addition to his fine exhibit of gladioluses, had an attractive group, containing *Lycoris squamigera*, *Calla Elliottiana*, *Montbretia*, in three varieties, and *Tritoma Pfitzeri*, one of the "red-hot pokers." Mr. C. H. Werner exhibited a large vase of *Hydrangea paniculata grandiflora*. The New York Botanical Garden made a display of flowers and fruits of herbaceous plants and of trees and shrubs; this collection attracted much attention.

The weather conditions during the exhibit were unfortunate, interfering much with the attendance. This is especially to be regretted in this case, for a finer display of gladioluses is rarely seen than was assembled at this exhibition.

The following awards were made for gladioluses in the open to all class. For the largest and best collection Mr. John Lewis Childs received the first prize. For the best twelve varieties, three spikes of each, the first prize went to Mr. T. A. Havemeyer, A. Lahodny, gardener; the second to Mr. H. Darlington, P. W. Popp, gardener. The first prize for the best vase of a white variety was awarded to Jacob Thomann & Sons, the second to Mr. John Lewis Childs. For the best vase of a pink variety Mr. E. S. Miller received first, Mr. John Lewis Childs, second. Mr. H. Darlington was awarded the first prize for a center piece.

In the class for non-commercial growers the following prizes were awarded for gladioluses. For the largest and best collection of named varieties, the first to Mr. T. A. Havemeyer, who also took first for the best six varieties, two spikes of each, Mr. Darlington taking second. The first prize was awarded to Mr. Havemeyer for the best vase of a white variety, and also for the best vase of pink, the second going to Mr. Darlington in the pink class.

The first prize for a collection of water-lilies, in the open to all class, went to Mr. Wm. Tricker. Special mention was given to a collection of seedling gladioluses, shown by Mr. E. S. Miller; to a collection of Chinese asters, exhibited by Mr. H. Darlington; and to a collection of hybrid tea outdoor roses, exhibited by Mr. Wm. Tricker.

The judges were James Stuart, Robert Stobo, and John Canning.

GEORGE V. NASH.

AUTUMN LECTURES, 1911.

Lectures have been and will be delivered in the Lecture Hall of the Museum Building of the Garden, Bronx Park, on Saturday afternoons, at four o'clock, as follows:

Sept. 2. "The Berlin Botanical Garden," Dr. W. A. Murrill.

Sept. 9. "Plants and People of Pinar del Rio, Cuba," Dr. C. Stuart Gager.

Sept. 16. "The Fruit Industry of the Northwest," Mr. George V. Nash.

Sept. 23. "The Vegetation of the Dismal Swamp of Virginia," Dr. Arthur Hollick.

Sept. 30. "The Progress of the Development of the New York Botanical Garden," Dr. N. L. Britton.

Oct. 7. "Some Scenic and Floral Features of Cuba," Dr. Marshall A. Howe.

Oct. 14. "The Movements of Plants," Dr. C. C. Curtis.

Oct. 21. "Some Types of Variegated Plants," Prof. R. A. Harper.

Oct. 28. "The Methods of Detecting Adulteration in Food and Drugs," Dr. H. H. Rusby.

The lectures, which occupy an hour, will be illustrated by lantern slides and otherwise. The doors will be closed at 4:00, and opened again at 4:15 to admit those arriving late.

NOTES, NEWS AND COMMENT.

Dr. Charles E. Fairman, of Lyndonville, N. Y., spent several days at the Garden in August, consulting the library and collections of fungi.

Mr. B. O. Dodge, accompanied by Mrs. Dodge, recently spent several days in Bermuda collecting fungi and algae.

Dr. P. A. Rydberg, curator, returned September 18 from a three months' collecting trip in southeastern Utah.

Dr. R. C. Benedict, who has recently been appointed instructor in botany in New York University, has been awarded a research scholarship at the Garden for a part of the months of August and September.

Mr. Wilmer G. Stover, a graduate of Miami University, Ohio, and formerly a student at the New York Botanical Garden, has been appointed instructor in botany in the State Agricultural College at Stillwater, Oklakoma, for the coming year.

The water lilies in the court of conservatory no. 1 are especially fine at present, particularly the tender sorts in the western pool. A novelty in this pool is the new one in the center, with large blue flowers, *Grosherzog Ernst Ludwig*. This resembles *Pennsylvania*

in some respects, but is even larger. The pure white *Castalia dentata* is very striking, with its large flowers. Of this same type are *Frank Trelease*, a rich crimson, mottled; *Geo. Huster*, a brilliant crimson; *O'Marana*, pink with a lighter stripe down the middle of the petals; and *kewensis*, light pink. Then there are a number of examples of *Castalia zanzibariensis*, including the type with deep violet-blue flowers, and the variety with rose-colored blooms. Of the same type are *capensis* and *coerulea*, both blue-flowered species; *pulcherrima* and *Wm. Stone*, both hybrids, the former with light blue, the latter with violet-blue flowers; and *Mrs. C. W. Ward*, a bright rosy pink. The royal water lily from Paraguay, *Victoria Cruziana*, has been flowering for some time, and is still doing so. The large leaves, with the broad upturned margins, make this plant a conspicuous object in the pool. The flowers have the scent of the pine apple, and appear during the night.

Meteorology for August.—The total precipitation recorded at the garden for the month was 6.50 inches. Maximum temperatures were recorded of 93° on the 17th and 94° on the 23d. A temperature of 98° was recorded between the 10th and 14th, but record failed to show the exact date. Also minimum temperatures were recorded of 52.5° on the 20th, 55° on the 22d, and 54° on the 31st.

The early part of the month was dry but the last eight days of the month were characterized by almost continuous and, for a part of the time, heavy rainfall.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

107 specimens of *Rubus* from eastern North America. (Distributed by Mr. W. H. Blanchard.)

7 specimens of fossil fruits from Wyoming. (Collected by Mr. Charles H. Sternberg.)

6 specimens of fossil figs from Wyoming. (Collected by Dr. F. H. Knowlton.)

36 specimens of Rosaceae from Mexico and Central America. (By exchange with the University of Copenhagen.)

4 specimens of flowering plants from Colorado. (By exchange with Mr. George E. Osterhout.)

2 photographs of type specimens. (From the Herbarium of the University of Copenhagen.)

1 specimen of *Trigonella monspeliaca* from Alabama. (Given by Prof. S. M. Tracy.)

1 specimen of *Ceratopteris* from Louisiana. (Given by Dr. R. C. Benedict.)

5 specimens of *Plagiothecium denticulatum* from Montana. (By exchange with Professor J. M. Holzinger.)

3 photographs of herbarium specimens from the collection of Dr. Focke, Bremen.

104 specimens from Utah. (By exchange with Professor C. P. Smith.)

10 photographs of fleshy fungi from Illinois and Oregon. (By exchange with Dr. C. F. Millspaugh.)

1 specimen of *Laetiporus speciosus* from Brooklyn, New York. (Given by Mr. J. J. Levison.)

22 specimens of woody fungi from Michigan. (By exchange with Dr. H. D. House.)

2 specimens of Mexican plants. (Given by Professor T. D. A. Cockerell.)

1 specimen of a fasciated strawberry. (Given by Miss Jane Oppenheim.)

1 specimen of *Gymnostomum laeve* from arctic America. (By exchange with Dr. Nyles Bryhn.)

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REPORT ON A VISIT TO THE ROYAL GARDENS, KEW, ENGLAND, AND TO THE BRITISH MUSEUM OF NATURAL HISTORY.

TO THE SCIENTIFIC DIRECTORS,

Gentlemen: Pursuant to your permission I sailed from New York, August 9, on the Cunard steamship "Lusitania," accompanied by Mrs. Britton, arriving at Fishguard, Wales, August 14, and proceeded to the Royal Gardens at Kew, Surrey, England, for the purposes: (1) of studying the living plant collections in the grounds and greenhouses with reference to comparison with our own and in particular those of cactuses; (2) for the comparison in the Kew Herbarium, and in that of the British Museum of Natural History, of over nine hundred specimens of Cuban plants of our recent collecting, which I took with me for that purpose, together with a considerable number from Jamaica; besides (3) for information concerning a number of questions which have arisen during the course of our work, only to be obtained by reference to older collections.

An exceptionally severe and prolonged drought had turned usually moist and green southern England to grey and brown, so that much of its normal beauty was absent; fields and lawns in particular were affected, the latter so much so in many places as to make us wonder if they could ever be brought back to their usual velvet-like condition without ploughing and resowing. Gardens also, naturally, had suffered severely: shrubs showed leaves and fruits dried up long before their time for falling; trees

were losing their leaves a month or more before they ordinarily would and herbaceous plants were flowering much less freely than is usual.

In spite of these, for England, extraordinary conditions, Kew was fascinatingly attractive, and the great number of different plants brought together from all parts of the world is almost bewildering, and of surpassing interest. Many of the young trees of many kinds, planted in recent years, had made good growths since my visit, of two years ago, and the living collections of all kinds had developed and had been increased in variety; I took note of many species desirable for cultivation with us; the climate conditions are so different, however, that a great many species, thriving in southern England in the open, can only be maintained under glass at New York.

The cactus collection at Kew contains a number of South American species not yet obtained for the Bronx, notably certain kinds of *Cereus* and related genera, and some of these are very fine large plants. Several of them came into bloom during my visit and a study of their flowers enabled me to satisfactorily refer them to the genera in which they properly belong. I asked, and was promised, cuttings of some of these cacti, for our own collection. The genera *Pereskia* and *Pereskiopsis*, in which Dr. Rose and I are at present especially interested, are not well represented at Kew, and I am sending duplicate plants there in exchange for the *Cereus* cuttings, together with some other cacti.

Our field work in Cuba has made our collections of plants from that island very large and representative, comprising, taken together with collections made under other auspices, not fewer than 20,000 different specimens. The study of these plants seemed to disclose the existence in Cuba of such an unexpectedly large number of species new to science that I deemed it very desirable to check these results by comparisons of a selection of the apparent novelties at the great herbarium at Kew, and to prove or disprove the identity of others of which I was uncertain. I accomplished this interesting investigation, though not without continuous application, for the number of observations required was very large. The general result is that our exploration work

adds some four hundred species to the known flora of Cuba, most of which are undescribed and new to science, a result well worth the time and cost entailed. Some of these I propose to describe myself, and to submit others to associates and correspondents for description. The greater number of novelties inhabit the mountainous portions of the Province of Oriente, explored by Dr. J. A. Shafer in 1909, and 1910 and 1911; the region next most prolific in new species is the mountainous part of Santa Clara, explored by myself, with Mrs. Britton, Professor F. S. Earle and Mr. Percy Wilson in 1910; and other new types are found in the collections made elsewhere. Important additions to knowledge of geographic distribution of plants have also been made.

The field is so evidently unexhausted, that I propose to continue Cuban exploration, as previously authorized, and I have commissioned Dr. Shafer to proceed to the Province of Pinar del Rio for two months' collecting, and thence to Santa Clara for one month; I desire to personally study portions of Oriente not yet visited by any of our collectors or by other botanists and to make this exploration in March and April of 1912.

Opportunity was taken during my visit to these great British institutions to obtain information relative to the type specimens of many American plants, for use in "North American Flora" and elsewhere; for reference to some literature of botany not contained in our library; for observations on variegated plants for the use of Professor Harper in his forthcoming investigation on this interesting topic; and for methods of cultivation of many species.

Mrs. Britton continued her studies of mosses both at Kew and at the British Museum and obtained data of importance for use in the forthcoming first bryological part of "North American Flora." We took with us parcels of duplicate West Indian mosses for both institutions, as exchanges. She made pleasant visits to Dr. Braithwaite in London, Mr. Dixon in Northampton and Mr. Nicholson in Lewes for consultation relative to bryological questions of mutual interest, as well as to the Misses Mitten, at Hurst Pierpoint; it will be remembered that the moss

collections of their father, the late distinguished William Mitten, became the property of the New York Botanical Garden by purchase, several years ago, this purchase having been made possible by generous friends of the Garden.

I also transmitted, at the time of my visit, both to the Royal Gardens, Kew, and to the British Museum of Natural History, sets of herbarium specimens collected by our Mr. R. S. Williams in Bolivia in 1901–3, when he accompanied the expedition organized by Sir Martin Conway; these specimens have been in course of study by Dr. H. H. Rusby who has published descriptions of many of them, while others will be described by him in a paper now ready for printing.

We were most cordially received at Kew and at the British Museum, and were given much important assistance in our work by the staffs of both institutions; and we are grateful to Col. Prain, Director of the Royal Gardens, and to Dr. Rendle, Keeper of the Museum's Department of Botany, and their associates for this kind coöperation.

Respectfully submitted,

N. L. BRITTON,

Director-in-Chief.

THE PLANT PHOTOGRAPH EXHIBIT.

A set of 214 enlarged photographs, illustrating plant societies, habit-, flower-, and fruit-characters of trees and other higher plants, as well as habit and structural characters of some of the larger algae and fungi, has been installed in the systematic museum of the Garden. The photographs, which are 11 × 14 inches in size, are mounted in glazed frames, 43 of them bearing four each of the bromide enlargements and seven bearing six each. The frames are fastened to the walls of the museum on the second floor and, so far as practicable, have been placed near the cases containing representatives of the species illustrated. The enlargements have been made chiefly from 4 × 5 negatives obtained by various Garden expeditions to Florida, the Bahamas, Cuba, Haiti, Santo Domingo, Porto Rico, and Panama. About

150 more enlargements have been made, provided with printed labels, and await the completion of frames in order to be installed. Both the present grouping in the frames and the position of the frames on the walls are provisional and will be subject to betterment from time to time as other photographs become available. The labels of the photographs thus far installed are given below, omitting the explanatory details and not attempting to reproduce the typography and alignment. In several cases where a label appears to be repeated, the accompanying photographs differ in detail, as would be evident if the labels were here reprinted in full.

The Deceptive Halimeda, *Halimeda simulans* M. A. Howe. Codium Family (Algae). Culebra Island, Porto Rico.

The Discoid Halimeda, *Halimeda discoidea* Decaisne. Codium Family (Algae). Caesar's Creek, Florida.

The Merman's Shaving-Brush, *Penicillus pyriformis* A. & E. S. Gepp. Codium Family (Algae). Bemini Harbor, Bahamas.

The Mermaid's Wine-Glass, *Acetabulum crenulatum* (Lamour.) Kuntze. Dasycladus Family (Algae). Miami, Florida.

The Sea Broom, *Cladocephalus scoparius* M. A. Howe. Codium Family (Algae). Great Exuma, Bahamas.

The Goblet Udotea, *Udotea cyathiformis* Decaisne. Codium Family (Algae). Bahama Islands.

The Coherent Udotea, *Udotea conglutinata* (Ell. & Soland.) Lamour. Codium Family (Algae). Bahama Islands.

Halimedas with Sporangia, *Halimeda Tuna* (Ell. & Soland.) Lamour. and *Halimeda tridens* (Ell. & Soland.) Lamour. Codium Family (Algae). Culebra Island and Tallaboa, Porto Rico.

The Honey-Comb Halimeda, *Halimeda favulosa* M. A. Howe. Codium Family (Algae). Cave Cays, Bahamas. [An entire plant.]

The Honey-Comb Halimeda, *Halimeda favulosa* M. A. Howe. Codium Family (Algae). Cave Cays, Bahamas. [A portion of surface magnified.]

The Erect Goniolithon, *Goniolithon strictum* Fosl. Coralline Family (Algae). Stocking Island, Bahamas.

The Erect Goniolithon, *Goniolithon strictum* Fosl. Coralline Family (Algae). Stocking Island, Bahamas.

The Peeling Goniolithon, *Goniolithon decutescens* (Heyd.) Fosl. Coralline Family (Algae). Great Exuma, Bahamas.

The Peeling Goniolithon, *Goniolithon decutescens* (Heyd.) Fosl. Coralline Family (Algae). Bermuda. (A magnified section.)

The Antillean Lithophyllum, *Lithophyllum Antillarum* Fosl. & Howe. Coralline Family (Algae). Culebra, Porto Rico. [An entire plant.]

The Antillean Lithophyllum, *Lithophyllum Antillarum* Fosl. & Howe. Coralline Family (Algae). Culebra, Porto Rico. [A magnified section.]

The Broad-Topped Goniolithon, *Goniolithon acropetum* Fosl. & Howe. Coralline Family (Algae). Culebra Island, Porto Rico. [An entire plant.]

The Broad-Topped Goniolithon, *Goniolithon acropetum* Fosl. & Howe. Coralline Family (Algae). Culebra Island, Porto Rico. [A magnified section.]

The Northern Lithothamnion, *Lithothamnion glaciale* Kjellm. Coralline Family (Algae). Topsail, Newfoundland. [Entire plants.]

The Northern Lithothamnion, *Lithothamnion glaciale* Kjellm. Coralline Family (Algae). Topsail, Newfoundland. [Magnified section.]

The Northern Lithothamnion, *Lithothamnion glaciale* Kjellm. Coralline Family (Algae). Topsail, Newfoundland. [Magnified section.]

The Bermudian Lithophyllum, *Lithophyllum bermudense* Fosl. & Howe. Coralline Family (Algae). Spanish Point, Bermuda. [Magnified section.]

The Labyrinthine Lithophyllum, *Lithophyllum daedaleum* Fosl. & Howe. Coralline Family (Algae). Santurce, Porto Rico. [An entire plant.]

The Labyrinthine Lithophyllum, *Lithophyllum daedaleum* Fosl. & Howe. Coralline Family (Algae). Santurce, Porto Rico. [Magnified section.]

The Labyrinthine Lithophyllum, *Lithophyllum daedaleum* Fosl. & Howe. Coralline Family (Algae). Guánica Harbor, Porto Rico.

A Bank of Coralline Algae. Haingsisi, Malay Archipelago.

The Glistening Ink-Cap Mushroom, *Coprinus micaceus* (Bull.) Fr. Mushroom Family. Upsala, Sweden.

Scorched Russula. *Russula adusta* (Pers.) Fr. Mushroom Family. Hammarby, near Upsala, Sweden.

The Fat Pholiota, *Pholiota adiposa* (Fr.) Quél. Mushroom Family. New York Botanical Garden.

The Fat Pholiota, *Pholiota adiposa* (Fr.) Quél. Mushroom Family. New York Botanical Garden.

The Artists' Bracket-Fungus, *Elfvingia megaloma* (Lév.) Murrill. Bracket-Fungus Family. New York Botanical Garden.

The Variegated Bracket-Fungus, *Coriolus versicolor* (L.) Quél. Bracket-Fungus Family. New York Botanical Garden.

The Variegated Bracket-Fungus, *Coriolus versicolor* (L.) Quél. Bracket-Fungus Family. New York Botanical Garden.

The Showy Laetiporus, *Laetiporus speciosus* (Batt.) Murrill. Bracket-Fungus Family. On the trunk of a Red Oak, Palisades, New Jersey.

The Gill-Pored Daedalea, *Daedalea confragosa* (Bolt.) Pers. Bracket-Fungus Family, New York Botanical Garden.

The Scaly Bracket-Fungus, *Polyporus caudicinus* (Scop.) Murrill. Bracket-Fungus Family. London, England.

The Border of a Fresh-Water Swamp in the Bahamas, New Providence.

A "Savanna" and a "Coppice" in the Bahamas, Great Inagua.

Salina Vegetation in Santo Domingo, Saona Island, Province of Seibo.

Salina Vegetation in Santo Domingo, Saona Island, Province of Seibo.

Seashore Vegetation in the Bahamas, New Providence.

Seashore Vegetation in the Bahamas, Pine Cay, Caicos Islands.

Seashore Vegetation in the Bahamas, Sheep Cay, Great Inagua.

Seashore Vegetation of the Supposed First Landing Place of Columbus in America, Watlings Island.

Sand-Dune Vegetation. Anastasia Island, near St. Augustine, Florida.

Sand-Dune Vegetation. Anastasia Island, near St. Augustine, Florida.

Seashore Vegetation of Southern Porto Rico, near Ponce.

Vegetation of a Cuban Limestone Cliff. Baños San Vicente, Province of Pinar del Rio, Cuba.

The Vegetation of a "Hammock" of Southern Florida. Near Cutler, Florida.

A "Pine Island" and "Prairie" of Southern Florida. Near Cutler, Florida.

Vegetation of the Pinelands of Southern Florida. Near Cutler, Florida.

The Slash Pine or Caribbean Pine, *Pinus caribaea* Morelet. Pine Family. Near Cutler, Florida.

The Vegetation of a Tropical Mountain Forest. Mt. Mandios, near Utuado, Porto Rico.

A Well-Watered Tropical Mountain Forest. Between Cinchona and Morce's Gap, Jamaica.

Mountain Undergrowth in Haiti, Mt. Casse.

Lowland River-Bank Vegetation in Santo Domingo. La Romano, Province of Seibo.

Riverside Vegetation in Jamaica. On the Rio Cobre.

A Roadside Thicket in Panama. Near Mt. Hope, Canal Zone.

The Traveler's Tree, *Ravenala madagascariensis* Sonnerat. Banana Family. Hope Gardens, Kingston, Jamaica.

The Wild Plantain, *Bihai* sp. Banana Family. Near Lion Hill, Canal Zone, Panama.

The Sugar Cane, *Saccharum officinarum* L. Grass Family. Hope Gardens, Kingston, Jamaica.

The Sugar Cane, *Saccharum officinarum* L. Grass Family. Santiago de las Vegas, Cuba.

Cultivation of the Sugar Cane, *Saccharum officinarum* L. Grass Family. Bayeux, Haiti.

The Wild Cane, *Gynerium saccharoides* Humb. & Bonpl. Grass Family. Mayagüez, Porto Rico.

Rock Ferns. Above Goeschenen, Switzerland.

The Deer-Fern, *Struthiopteris Spicant* (L.) Scop. Fern Family. Above Goeschenen, Switzerland.

The Beech-Fern, *Phegopteris* sp. Above Goeschenen, Switzerland.

The Common Polypody, *Polypodium vulgare* L. Fern Family. Norrköping, Sweden.

Tropical Ferns, *Dicranopteris* sp. Between Cayey and Caguas, Porto Rico.

Tree Ferns, *Cyathea arborea* (L.) J. E. Sm. On military road, between Cayey and Caguas, Porto Rico.

Tree Ferns. Between Utuado and Adjuntas, Porto Rico.

Mountain Palm, Palma de Sierra, *Gaussia princeps* Wendl. Palm Family. Baños San Vicente, Province of Pinar del Rio, Cuba.

Cohune Palm, Corozo Gallinazo, *Attalea Cohune* Mart. Palm Family. Culebra, Canal Zone, Panama.

The Date Palm, *Phoenix dactylifera* L. Palm Family. Bay of Mariel, Cuba.

The Cedar of Lebanon, *Cedrus Cedrus* (L.) Lyons. Pine Family. Royal Botanic Gardens, Kew, England.

The Slash Pine or Caribbean Pine. *Pinus caribaea* Morelet. Pine Family. New Providence, Bahamas.

The Haitian Pine, *Pinus occidentalis* Sw. Pine Family. Near Marmelade, Haiti.

The Mexican Bald Cypress, Ahuehuete, *Taxodium mucronatum* Tenore. Pine Family. Mexico City, Mexico.

The Mexican Bald Cypress, Ahuehuete, *Taxodium mucronatum* Tenore. Pine Family, Mexico City, Mexico.

The Southern Yucca, Palma de San Pedro, *Yucca australis* (Engelm.) Trelease. Yucca Family. Near Puebla, Mexico.

The Porto Rican Mountain Palm, *Acrista monticola* O. F. Cook. Palm Family. On Mt. Mandios, near Utuado, Porto Rico.

The Porto Rican Mountain Palm, *Acrista monticola* O. F. Cook. Pam Family. On Mt. Mandios, near Utuado, Porto Rico.

The Porto Rican Royal Palm, *Roystonea borinquena* O. F. Cook. Palm Family. Near Utuado, Porto Rico.

The Porto Rican Corozo Palm, *Acrocomia media* O. F. Cook. Palm Family. Mayagüez, Porto Rico.

Cohune Palm, Corozo Gallinazo, *Attalea Cohune* Mart. Palm Family. Near Gatun, Canal Zone, Panama.

Cohune Palm, Corozo Gallinazo, *Attalea Cohune* Mart. Palm Family. Culebra, Canal Zone, Panama.

Cohune Palm, Corozo Gallinazo, *Attalea Cohune* Mart. Palm Family. Culebra, Canal Zone, Panama.

The Pacuai Palm, *Astrocaryum panamense* Linden (?). Palm Family. Culebra, Canal Zone, Panama.

The Silvery Thatch-Palm, *Coccothrinax argentea* (Lodd.) Sarg. Palm Family. U. S. Naval Reservation, Guantanamo Bay, Cuba.

The Silvery Thatch-Palm, *Coccothrinax argentea* (Lodd.) Sarg. Palm Family. U. S. Naval Reservation, Guantanamo Bay, Cuba.

The Silvery Thatch-Palm, *Coccothrinax argentea* (Lodd.) Sarg. Palm Family. Tenados, Great Inagua, Bahamas.

The Silvery Thatch-Palm, *Coccothrinax argentea* (Lodd.) Sarg. Palm Family. Consuelo, Province of Macoris, Santo Domingo.

The Royal Palm, *Roystonea regia* (H.B.K.) O. F. Cook. Palm Family. Near Santiago de las Vegas, Cuba.

The Mountain Cabbage Palm, *Roystonea oleracea* (Jacq.). Palm Family. Near Cinchona, Blue Mountains, Jamaica.

The Porto Rican Royal Palm, *Roystonea borinquena* O. F. Cook. Palm Family. Mayagüez, Porto Rico.

The Cane Palm, Palma Caña, Japa, *Sabal Japa* C. Wright. Palm Family. Herradura, Province of Pinar del Rio, Cuba.

The Epaulet Palm, *Pritchardia Thurstoni* F. Muell. & Drude and Queen Alexandra's Palm, *Archontophoenix Alexandrae* (F. Muell.) H. Wendl. & Drude. Hope Gardens, Kingston, Jamaica.

The Oil Palm, *Elaeis guineensis* Jacq. Palm Family. Bayeux, Haiti.

Cuban Palms. Herradura, Province of Pinar del Rio, Cuba.

The Corozo or Corojo Palm, *Acrocomia fusiformis* (Swartz) O. F. Cook. Palm Family. Near San Juan Hill, Santiago, Cuba.

The Bottle Palm, Palma Barrigona, *Colpothrinax Wrightii* Griseb. & Wendl. Palm Family. Near Herradura, Province of Pinar del Rio, Cuba.

The Bottle Palm, Palma Barrigona, *Colpothrinax Wrightii* Griseb. & Wendl. Palm Family. Near Herradura, Province of Pinar del Rio, Cuba.

The Trumpet Tree, *Cecropia peltata* L. Mulberry Family. Mt. Morales, near Utuado, Porto Rico.

The Trumpet Tree, *Cecropia peltata* L. Mulberry Family. Mt. Morales, near Utuado, Porto Rico.

The Large-Flowered Agati, *Agati grandiflora* (L.) Desv. Pea Family. Ancon, Canal Zone, Panama.

Large-Leaved Coccolobis, *Coccolobis grandifolia* Jacq. Buckwheat Family. Utuado, Porto Rico.

Single Leaf of Large-Leaved Coccolobis, *Coccolobis grandifolia* Jacq. Buckwheat Family. Utuado, Porto Rico.

The Panama Mangrove, *Pelliciera Rhizophorae* Trian. & Planch. Tea Family. Balboa, Canal Zone, Panama.

Red Mangrove, *Rhizophora Mangle* L. Mangrove Family. San Juan, Porto Rico.

Red Mangrove, *Rhizophora Mangle* L. Mangrove Family. Near Guáncia, Porto Rico.

Red Mangrove, *Rhizophora Mangle* L. Mangrove Family. Miami, Florida.

Red Mangrove, *Rhizophora Mangle* L. Mangrove Family. Bayeux, Haiti.

The Panama Mangrove, *Pelliciera Rhizophorae* Trian. & Planch. Tea Family. Balboa, Canal Zone, Panama. [There are four views of this, including flowers, fruit, stages of growth, etc.]

The Black Mangrove, *Avicennia nitida* Jacq. Vervain Family. Ponce, Porto Rico.

The Seven-Year Apple, *Genipa clusifolia* (Jacq.) Griseb. Madder Family. Sheep Cay, Great Inagua, Bahamas.

The Spiny Catesbaea, *Catesbaea spinosa* L. Madder Family. Esperanza, Province of Pinar del Rio, Cuba.

The Spiny Catesbaea, *Catesbaea spinosa* L. Madder Family. Esperanza, Province of Pinar del Rio, Cuba.

The Indian Almond, *Terminalia Catappa* L. White Mangrove Family. Aguadilla, Porto Rico.

The Indian Almond, *Terminalia Catappa* L. White Mangrove Family. Bayeux, Haiti.

The Indian Almond, *Terminalia Catappa* L. White Mangrove Family. Aguadilla, Porto Rico. [Showing fruit.]

The Black Olive Tree, *Bucida Buceras* L. White Mangrove Family. Great Inagua, Bahamas.

Tropical Station of the New York Botanical Garden. Cinchona, Blue Mountains, Jamaica.

Tree Ferns, Eucalpytus Trees, etc. Cinchona, Blue Mountains, Jamaica.

Tree Ferns, Eucalyptus Trees, etc. Cinchona, Blue Mountains, Jamaica.

Large-Flowered Beaumontia, *Beaumontia grandiflora* Wall. Dogbane Family. Hope Gardens, Kingston, Jamaica.

The Common Fig, *Ficus Carica* L. Mulberry Family. Bozen, Tyrol, Austria.

The Golden Fig, or Florida Banyan (?), *Ficus aurea* Nutt. (?). Mulberry Family. Key West, Florida.

Short-Leaved Fig, *Ficus brevifolia* Nutt. Mulberry Family. Sheep Cay, Great Inagua, Bahamas.

Short-Leaved Fig, *Ficus brevifolia* Nutt. Mulberry Family. Sheep Cay, Great Inagua, Bahamas.

A Grape-Fruit Tree, *Citrus decumana* L. Rue Family. Hope Gardens, Kingston, Jamaica.

Fruits and Foliage of the Akee, *Blighia sapida* Konig. Hope Gardens, Kingston, Jamaica.

The Soursop, *Anona muricata* L. Custard-Apple Family. Nassau, New Providence, Bahamas.

Coffee, *Coffea arabica* L. Madder Family. Mayagüez, Porto Rico.

The Flame Tree, Flamboyant, Royal Poinciana, *Delonix regia* (Bojer) Raf. Senna Family. Cap Haitien, Haiti.

The Flame Tree, Flamboyant, Royal Poinciana, *Delonix regia* (Bojer) Raf. Senna Family. Santurce, Porto Rico.

The Flame Tree, Flamboyant, Royal Poinciana, *Delonix regia* (Bojer) Raf. Senna Family. Santurce, Porto Rico. [Flowers and foliage in detail.]

The Flame Tree, Flamboyant, Royal Poinciana, *Delonix regia* (Bojer) Raf. Senna Family. Santurce, Porto Rico. [Tree laden with pods.]

The Guango Tree, Algarroba, *Pithecolobium Saman* (Jacq.) Benth. Mimosa Family. Hope Gardens, Kingston, Jamaica.

The Guango Tree, Algarroba, *Pithecolobium Saman* (Jacq.) Benth. Mimosa Family. Province of Pinar del Rio, Cuba.

The Wild Tamarind, *Lysiloma bahamensis* Benth. Mimosa Family. Great Inagua, Bahamas.

The Sensitive Plant, *Mimosa pudica* L. Mimosa Family. Lion Hill, Canal Zone, Panama.

The Milky Euphorbia, *Euphorbia lactea* Haw. Spurge Family. Great Inagua, Bahamas.

The Milky Euphorbia, *Euphorbia lactea* Haw. Spurge Family. Near Havana, Cuba.

Spanish Bayonet or Dagger Plant, *Yucca aloifolia* L. Yucca Family. Montego Bay, Jamaica.

The Ocotillo or Candlewood, *Fouquieria splendens* Engelm. Coach-whip Family. Near Tucson, Arizona.

The Balsam Apple, *Momordica Charantia* L. Gourd Family. Santurce, Porto Rico.

The Caltrop or Bur-Nut, *Tribulus cistoides* L. Caltrop Family. U. S. Naval Reservation, Guantanamo Bay, Cuba.

Gray Nickers, *Guilandina Crista* (L.) Small. Senna Family. Great Inagua, Bahamas.

The Hooked Pepper, *Piper aduncum* L. Pepper Family. On a roadside between Adjuntas and Ponce, Porto Rico.

A Century Plant in Flower, *Agave americana* L. Amaryllis Family. Nassau, New Providence, Bahamas.

Sisal, Henequen, or Pita, *Agave sisalana* Perrine. Amaryllis Family. West Caicos, British West Indies.

Pulque Plant, Maguey, or Century Plant, *Agave atrovirens* Karw. Amaryllis Family. Texcoco, Mexico.

Maguey, The Mauritius Hemp, *Furcraea gigantea* Vent. Amaryllis Family. Mayagüez, Porto Rico.

The Spiniest Prickly Pear, *Opuntia spinosissima* Mill. Cactus Family. Hope Gardens, Kingston, Jamaica.

Prickly Pear, *Opuntia* sp. Cactus Family. U. S. Naval Reservation. Guantanamo Bay, Cuba.

Nash's Prickly Pear, *Opuntia Nashii* Britton. Cactus Family. Great Inagua, Bahamas.

Spineless Prickly Pear, *Opuntia inermis* DC. Cactus Family. Boot Key, Florida.

The Florida-Key Cereus, *Cephalocereus keyensis* Britton & Rose. Cactus Family. Key West, Florida.

Millspaugh's Cereus, *Cephalocereus Millspaughii* Britton. Cactus Family. Mariguana, Bahamas.

Royen's Cereus, *Cephalocereus Royeni* (L.) Britton & Rose. Cactus Family. Guánica, Porto Rico.

Cephalocereus sp. Cactus Family. La Romana, Province of Seibo, Santo Domingo.

Fernow's Harrisia, *Harrisia Fernowii* Britton. Cactus Family. Near Guantanamo, Cuba.

The Woolly Harrisia, *Harrisia eriophora* (Pfeiff.) Britton. Cactus Family. Bay of Mariel, Cuba.

Millspaugh's Cereus, *Cephalocereus Millspaughii* Britton. Cactus Family. Great Inagua, Bahamas.

The Cuban Tree-Cereus, *Dendrocereus nudiflorus* (Engelm.) Britton & Rose. Cactus Family. U. S. Naval Reservation, Guantanamo Bay, Cuba.

The Jamacaru Cereus, *Cereus Jamacaru* DC. Cactus Family. Santurce, Porto Rico.

The Jamacaru Cereus, *Cereus Jamacaru* DC. Cactus Family. Santurce, Porto Rico.

The Five-Angled Cereus, *Acanthocereus pentagonus* (L.) Britton & Rose. Cactus Family. Boot Key, Florida.

Schott's Cereus, *Lophocereus Schottii* (Engelm.) Britton & Rose. Cactus Family. Torres, Sonora, Mexico.

The Inagua Melon-Cactus, The Turk's-Head Cactus, *Cactus inaguensis* Britton & Rose. Cactus Family. Little Inagua, Bahamas.

The Inagua Melon-Cactus, The Turk's-Head Cactus, *Cactus inaguensis* Britton & Rose. Cactus Family. Mariguana, Bahamas.

Harlow's Melon-Cactus, *Cactus Harlowii* Britton & Rose. Cactus Family. U. S. Naval Reservation, Guantanamo Bay, Cuba.

The Bahamian Fiddle-Flower, *Pedilanthus bahamensis* Millsp. Spurge Family. Grand Turk Island, West Indies.

The Sea-Grape, *Coccolobis Uvifera* (L.) Jacq. Buckwheat Family. Bayeux, Haiti.

The Sea-Grape, *Coccolobis Uvifera* (L.) Jacq. Buckwheat Family. San Juan, Porto Rico.

The Sea-Grape, *Coccolobis Uvifera* (L.) Jacq. Buckwheat Family. San Juan, Porto Rico.

The Sea-Grape, *Coccolobis Uvifera* (L.) Jacq. Buckwheat Family. Watlings Island, Bahamas.

Logwood Trees, *Haematoxylon campechianum* L. Senna Family. Near Montego Bay, Jamaica.

The Mahogany Tree, *Swietenia Mahagoni* Jacq. Mahogany Family. Great Inagua, Bahamas.

The Lignum-Vitae Tree, *Guaiacum sanctum* L. Caltrop Family. Great Inagua, Bahamas.

Lignum-Vitae Trees, *Guaiacum officinale* L. Caltrop Family. Kingston, Jamaica.

The Silk-Cotton Tree, *Ceiba pentandra* (L.) Gaertn. Bombax Family. Nassau, New Providence, Bahamas.

The Silk-Cotton Tree, *Ceiba pentandra* (L.) Gaertn. Bombax Family. Nassau, New Providence, Bahamas.

The Silk-Cotton Tree, *Ceiba pentandra* (L.) Gaertn. Bombax Family. Near Ponce, Porto Rico.

The Silk-Cotton Tree, *Ceiba pentandra* (L.) Gaertn. Bombax Family. Nassau, New Providence, Bahamas.

The Calabash Tree, *Crescentia Cujete* L. Bignonia Family. Bayeux, Haiti.

The Calabash Tree, *Crescentia Cujete* L. Bignonia Family. Bayeux, Haiti.

The Calabash Tree, *Crescentia Cujete* L. Bignonia Family. Ponce, Porto Rico.

The Welted Trumpet Flower, *Bignonia venusta* Ker. Bignonia Family. Hope Gardens, Kingston, Jamaica.

The West Indian Ebony, *Brya Ebenus* (L.) DC. Pea Family. Near Kingston, Jamaica.

The "French Oak," *Macrocatalpa longissima* (Jacq.) Britton. Bignonia Family. Hope Gardens, Kingston, Jamaica.

The Teak Tree, *Tectona grandis* L. Verbena Family. Hope Gardens, Kingston, Jamaica.

The Alligator Pear, Avocado, Aguacate, *Persea Persea* (L.) Cockerell. Laurel Family. Bayeux, Haiti.

The Akee Tree, *Blighia sapida* Konig. Soapberry Family. Hope Gardens, Kingston, Jamaica.

The Jamaican Tree-Blueberry, *Vaccinium meridionale* Sw. Huckleberry Family. Near Cinchona, Blue Mountains, Jamaica.

The Norway Spruce, *Picea Abies* (L.) Karsten. Pine Family. Hammarby, near Upsala, Sweden.

The European Beech, *Fagus sylvatica* L. Beech Family. In Forest of Fontainebleau, France.

The Horse-Chestnut, *Aesculus Hippocastanum* L. Buckeye Family. Bonn, Germany.

The Maidenhair Tree, The Ginkgo, *Ginkgo biloba* L. Ginkgo Family. Washington, D. C.

Aquatic Vegetation in the Tropics. Higüey, Province of Seibo, Santo Domingo.

Vegetation of a Tropical Fresh-Water Swamp. Between Mt. Hope and Mindi, Canal Zone, Panama.

The Fern-like Azolla, *Azolla filiculoides* Lam. (?). Salvinia Family. In a marsh, near Mt. Hope, Canal Zone, Panama.

The Japanese Golden Lily, *Lilium auratum* Lindl. Lily Family. In the Botanical Garden, Upsala, Sweden.

Lichens and Mosses. Hammarby, near Upsala, Sweden.

The Common Juniper, *Juniperus communis* L. Pine Family. Near Upsala, Sweden.

The "French Cotton," *Calotropis procera* (Willd.) Dryand. Milkweed Family. Near Aibonito, Porto Rico.

The Silk-Cotton Tree, *Ceiba pentandra* (L.) Gaertn. Bombax Family. Ahorca Lagarto, Canal Zone, Panama.

The Silk-Cotton Tree, *Ceiba pentandra* (L.) Gaertn. Bombax Family. Near Havana, Cuba.

Canoe-Making from a Trunk of the Silk-Cotton Tree, *Ceiba pentandra* (L.). San Lorenzo, Province of Samana, Santo Domingo.

The Corkwood Tree, *Ochroma lagopus* Swartz. Bombax Family. Near Utuado, Porto Rico.

MARSHALL A. HOWE.

NOTES, NEWS AND COMMENT.

Dr. Arthur Hollick, curator, has been granted a leave of absence for the purpose of continuing his study of the paleobotanical material collected by him in Alaska in 1903, under the direction of the U. S. Geological Survey.

Drs. J. C. Arthur and F. D. Kern, of Purdue University, Indiana, recently spent some time collecting plant rusts in Colorado in connection with work on "North American Flora."

Mr. C. A. Schwarze, formerly a student of the Garden and Columbia University, has been appointed assistant in botany in Columbia University for the coming year.

Mr. A. B. Stout, of the University of Wisconsin, has been appointed director of the laboratories, to succeed Mr. Fred J. Seaver, who has been transferred to a curatorship.

Dr. W. A. Murrill lectured before the Lenox Garden Club at Stockbridge, October 3, on the subject of edible and poisonous mushrooms. He also secured with the assistance of Messrs. Field and Hoffmann, an important collection of fleshy fungi for the Garden herbarium.

On October 13, Dr. Murrill left for a trip to Washington, Oregon and California, the object of the trip being to collect and study fleshy fungi.

Sir Frederick W. Moore, director of the Royal Botanical Gardens, Glasnevin, Dublin, visited the New York Botanical Garden on October 9 and 10, at the close of a trip to the eastern United States and Canada. Arrangements were made with Sir Frederick for an exchange of specimens of greenhouse plants, there being many species in the New York collections which have never been in cultivation in the Old World, and a large number of them duplicated.

No. 26, volume 7, of the Bulletin of the New York Botanical Garden was issued October 12. This number completes the volume and, with the exception of the table of contents and index to the volume, is entirely given over to "A Biologic and Taxonomic Study of the Genus Gymnosporangium," the paper having been

offered as a thesis in Columbia University by Dr. F. D. Kern, associate botanist in Purdue University Agricultural Experiment Station, Indiana. The paper consists of 89 pages of text, eleven plates and 36 figures.

One of the principal longitudinal paths of the Garden, extending from the Newell Avenue entrance, at Williamsbridge, along the east side of the Bronx River, through the north meadows, and southward through the valley to the eastern end of the Boulder Bridge, is approaching completion. A difficult and tedious piece of construction work for this path, for a distance of about five hundred feet, on the edge of the river at the foot of a steep bank north of the Long Bridge, has been successfully accomplished by building a rubble stone wall to carry the path, from stones and boulders which have been saved for the purpose from old stone walls and exposed by grading operations in various parts of the grounds; the foot of the steep earth slope above this path is supported by a low wall of boulders, parallel with the similar low wall along the west side of the river road.

This river path will doubtless be a very popular and attractive walk, as soon as it can be opened to the public, connecting, as it will, with the trail leading south from the Boulder Bridge along the east side of the river, passing the Lorillard Mansion, where it leaves the Garden reservation, and continues on southward to the Linnaean Bridge at Pelham Avenue. It will afford a most attractive view of the scenery and the flora of the Bronx valley for over a mile.

Meteorology for September.—The total precipitation for the month was 1.55 inches. Maximum temperatures were recorded of 87.5° on the 2d and 10th, 85.5° on the 12th, and 89.5° on the 20th. Also minimum temperatures were recorded of 57° on the 9th, 38° on the 14th, and 53° on the 18th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

366 specimens from Brazil. (By exchange with the Bureau of Science, Manila.)

3 specimens of *Euphorbia arundelana* from Maryland. (Given by Mr. H. H. Bartlett.)

5 specimens of West Indian plants. (By exchange with the Royal Gardens, Kew, England.)

3 specimens of orchids from Jamaica. (By exchange with the Department of Agriculture, Jamaica, West Indies.)

11 specimens of Santo Domingo plants. (By exchange with Professor I. Urban, Royal Botanic Garden, Berlin, Germany.)

10 specimens of fungi from Glenwood, New Jersey. (Given by Mr. E. C. Volkert.)

12 specimens of fungi from Amityville, Long Island, New York. (Given by Dr. Bauer.)

15 specimens of fungi from Pittsfield, Massachusetts. (Given by Dr. B. T. Butler.)

102 specimens of fleshy fungi from Stockbridge, Massachusetts. (Collected by Dr. W. A. Murrill and Dr. W. Gilman Thompson.)

409 specimens of fleshy fungi from near New York City. (Collected by Dr. W. A. Murrill.)

26 specimens "North American Musci Pleurocarpi." (Distributed by Dr. A. J. Grout.)

12 specimens of ferns from the Philippine Islands. (By exchange with Mr. E. D. Merrill.)

1 specimen of fungus. (Given by Mr. Harvard S. Fawcett.)

10 specimens of polypores from Ohio. (By exchange with Mr. S. O. Overholts.)

1 specimen of cork. (Given by Dr. H. H. Rusby.)

25 specimens of fungi from New York. (Collected by Mr. F. J. Seaver and Professor Bruce Fink.)

1 specimen of fungus. (Given by Dr. Charles E. Fairman.)

25 specimens "Lichenes Suecici Exsiccati." Fascicle IX. (Distributed by Dr. G. O. A. Malme.)

1 specimen of *Encalypta ciliata* from Vermont. (Given by Mr. E. J. Winslow.)

2 specimens of mosses from Grand Manan, New Brunswick. (Given by Mrs. Elizabeth M. Dunham.)

28 specimens "Musci Acrocarpi Boreali-Americani." (Distributed by Professor John M. Holzinger.)

31 specimens "Ascomycetes." Fascicle 48. (Distributed by Dr. Heinrich Rehm.)

5 specimens of *Molendoa.* (By exchange with Professor Istoan Gyosffy.)

3 specimens of mosses from Colorado. (Given by Dr. J. S. Jewett.)

10 specimens of fungi from Colorado. (Given by Professor Ellsworth Bethel.)

5 specimens of fungi from Chinese Turkestan. (By exchange with the United States Department of Agriculture.)

30 specimens of woody fungi from North Carolina. (By exchange with Dr. H. D. House.)

3 specimens of fungi from North Carolina. (Given by Professor F. L. Stevens.)

LIBRARY ACCESSIONS FROM NOVEMBER 1, 1910, TO JUNE 30, 1911.

(*Concluded.*)

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REPORT OF A TRIP TO SOUTHEASTERN UTAH IN THE SUMMER OF 1911.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: In accordance with your instructions, I left New York on the 10th of June for a collecting trip of two months and a half in southeastern Utah. On my way out I visited Duluth, Minnesota, where I stayed a little over a week. During this time I went out collecting twice. The most interesting plant collected was *Rubus parviflorus* (*R. Nutkanus*), which grew in great profusion around the city. The plant is a typical Rocky Mountain plant. but one of those which come across the plains to the Great Lakes.

On the 24th of June, I arrived at Salt Lake City, Utah, and was met at the station by Professor A. O. Garrett, of the City High School. Professor Garrett was to accompany me on my trip during the summer and had invited me to his home for the few days I stayed in the city. Indeed, I am greatly indebted to Professor Garrett for all the help he gave me both in collecting and otherwise, as well as for a pleasant and most congenial companionship during the trip. He introduced me to the National Copper Bank, where I deposited the money needed for the trip. From the bank we received a letter of introduction to the leading commercial firm of southwestern Utah, viz., Cooper, Martin & Co., of Moab. Through them our checks were accepted everywhere and we had many advantages which we would not have had otherwise. Mr. Cooper also kindly furnished us

much valuable information, gave us letters of introduction and references to several persons in and around Monticello and Bluffs, and helped us in many other ways.

After having bought such supplies and provisions as we thought would be hard to get in the small country places, we left Salt Lake City on June 29th and arrived at Thompson Springs in the afternoon of the same day. We collected around the place for two or three hours. Thompson Springs is situated along a small creek in the desert, near the base of the Book Cliffs between Green and Grand Rivers. The principal vegetation consisted of sage-brush (*Artemisia tridentata*), shad-scale (*Atriplex confertifolia*), and other species of *Atriplex*. Mixed with these were species of *Sphaeralcea*, *Eriogonum*, *Eurotia*, *Dondia*, *Lepidum*, *Gilia*, *Cryptanthe*, *Abronia*, *Malacothrix* and others.

The following day we took the stage for Moab. The stage road runs over the desert plain, in most places similar to that around Thompson, but in several places we found tracts of real sand-dunes and in a few instances the plains are crossed by "washes," now mostly dry. About eight miles from Moab the road enters a canyon which leads down to the Grand River. The most interesting plant seen in this canyon, as well as at several other places in the region, was *Fraxinus anomala* which on account of its leaves, usually unifoliolate, looks more like an aspen than an ash. While waiting for the ferry, we collected about a dozen species under the steep cliffs of the Grand River Canyon. The most interesting of these were *Odostemon* (*Berberis*) *Fendleri* and a large species of *Asclepias*. From the berries of the first a kind of jam is said to be made by the Mexicans and Indians. Our stay at Moab was made very pleasant by many of the inhabitants there, who were very friendly and helpful. Especially do I wish to extend my thanks to Mr. Cooper, mentioned above, Dr. Williams, the two Mr. Clarks, uncle and nephew, and others. Dr. Williams showed us several favors, and the Clarks offered us the free disposition of the old boarding-house at their stamp-mill, during our stay in the La Sal Mountains.

Moab is situated in a valley running southeast from Grand

River and surrounded by steep palisade-like cliffs on both sides. It follows Pass Creek, a tributary to Mill Creek. The latter enters the valley just above the town and empties into Grand River a mile or two below the town. Naturally most of the valley is desert, but made fertile by irrigation. Only along Grand River and Mill Creek are there some natural meadows. Under irrigation excellent peaches and apples are raised, especially the former, although this year the crop was rather poor. Also some alfalfa, corn and vegetables are raised. A plan is under way to materially increase the irrigated area by making a big reservoir to store up the superfluous flood-water in the spring and during other seasons. Rain is not frequent but when it comes it usually comes in great torrents. If the planned reservoir is built the irrigated area will be more than doubled.

Moab is situated at an altitude of 4,000 feet. The valley, except the small natural meadows, has a desert flora. This contains a good many plants from the south and shows many elements characteristic of the flora of Arizona. I have not yet begun the determination of the plants, and cannot now give any list, but species of *Atriplex* and *Artemisia*, together with *Sarcobatus vermiculatus*, were predominant.

We had hard work to secure a team to take us up to the La Sal Mountains, for half the town were going away to celebrate the 4th of July at Monticello, 65 miles further south, and nearly all horses were used for the trip. We decided to make a trip to Pritchett Valley in the meantime. We could get only one saddle-horse at the livery-stable and that one not too good, but Dr. Williams kindly loaned us his horse. We secured Mr. Hall, the deputy sheriff, as a guide, and a gentleman from Denver also accompanied us.

The Pritchett Canyon joins the Grand River Canyon about 6 miles below Moab. Along the Grand River we found some woody vegetation consisting of several species of *Quercus*, one each of *Celtis*, *Rhamnus* and *Populus*, two of *Rhus* and *Salix*, etc., and a few peach trees with some of the fruit ripe enough to eat. To us the trees looked more like escaped ones than the remnants of an abandoned orchard. The trail up the Pritchett Canyon

was very steep and in some places rather dangerous. In some places we had to lead our horses. The scenery was very interesting but the flora was poor. The woody vegetation consisted mostly of cedars (*Juniperus monosperma*), pinyons, mountain-mahogany, service-berries, scrub-oaks, etc. The cliffs on both sides were very steep; many had alcoves and caves formed in them; others were of most phantastic forms. The most remarkable in form were the so called Ostrich Rock and the

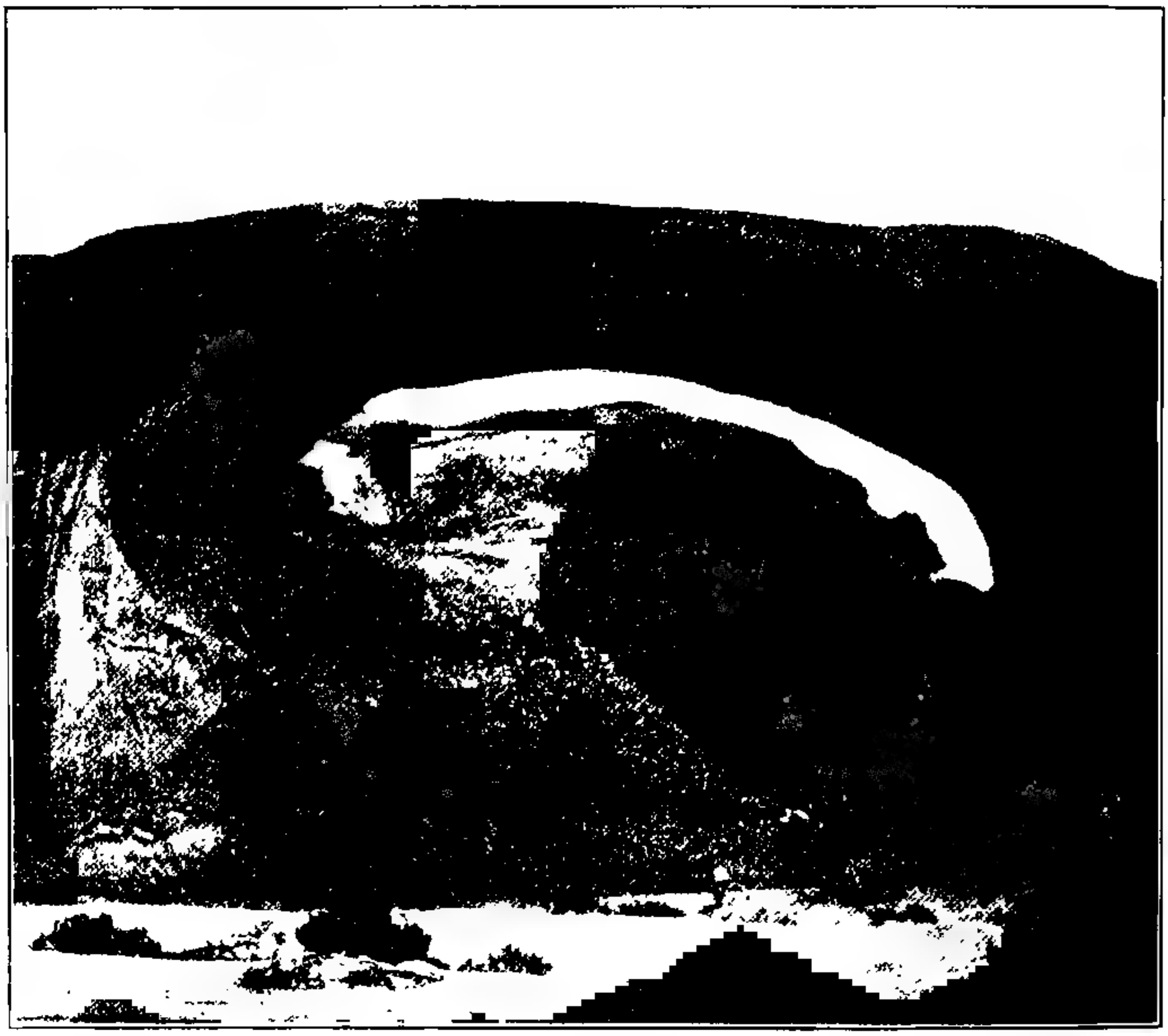

FIG. 33. "El Archo" or "Pickyabo," bridge in Pritchett Valley.

Block Bridge, but the most interesting part of the scenery was the natural bridges. An illustration of El Archo or Pickayabo is given (fig. 33). The bridge is 62 feet high and the arch 49 feet high and 120 feet long. It is probably formed from a cave, in which a hole was first formed in the roof and then enlarged more and more by the action of the water, until at last a bridge was formed. Hall's bridge, discovered by our guide, is of about the

same size. It is situated in a more inaccessible side canyon and has been seen by only half a dozen visitors, and possibly a few hunters. According to Mr. Hall the photographs taken on our trip were the first ones ever taken of this bridge.

On the 5th of July we started on our trip to the La Sal Mountains. We had found, by chance, a man who was going up to the mountains for a load of lumber and was willing to take us along. The vehicle, a heavy lumber-wagon, was not a very comfortable one. Our seats consisted of a canvas trunk

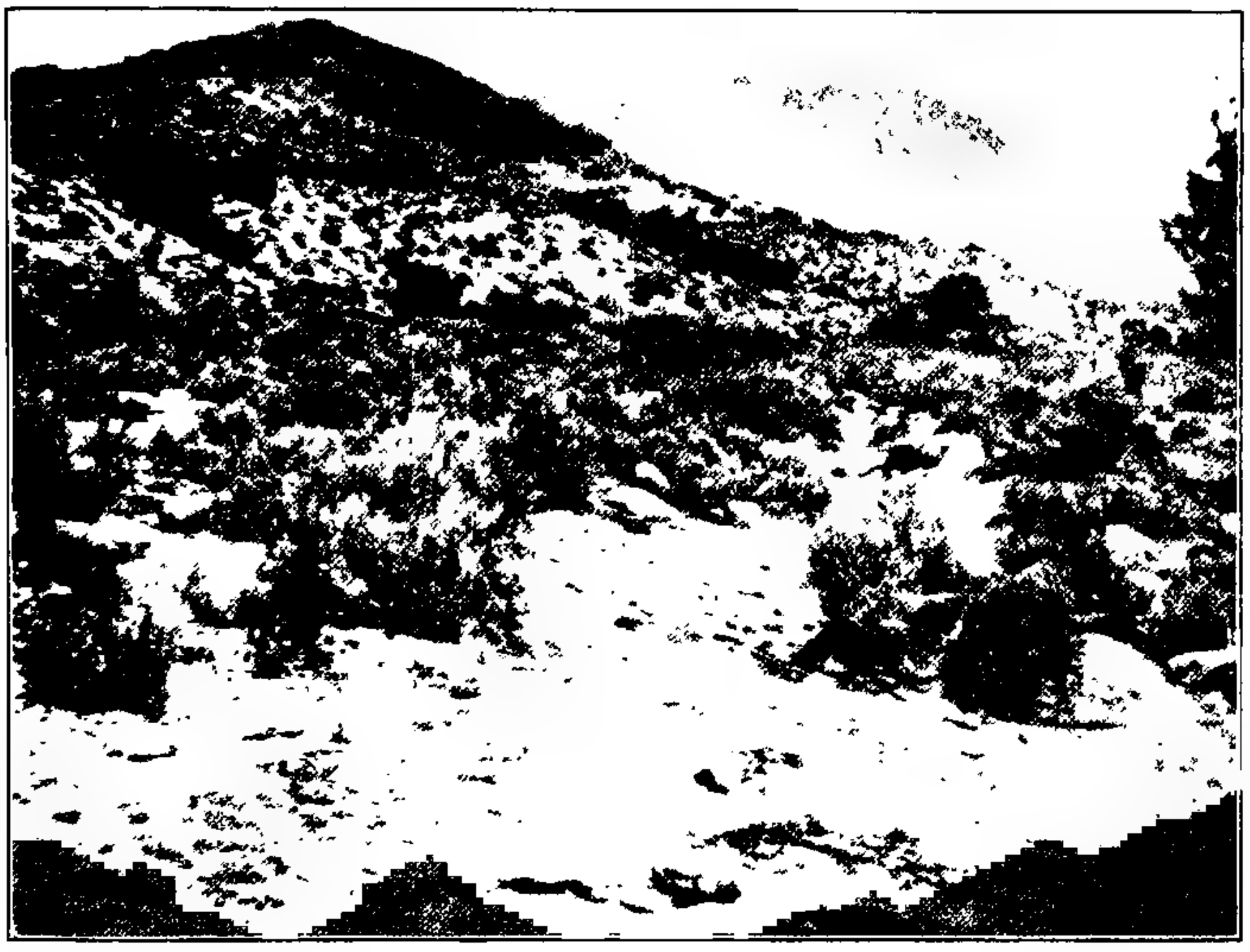

FIG. 34. Lower foot-hills of La Sal Mountains showing the transition between the "desert-valley formation" in the foreground and the "foot-hill formation" above.

containing our supplies, and belonging to the Garden, together with our bedding. The distance by wagon-road from Moab to the La Sal Mountains is 25 miles. For nearly half the distance the road follows the valley of the Pass Creek. Near the place where it leaves the Creek, we stopped for lunch and here the picture (fig. 34) was taken. It illustrates the point of change from the valley flora characterized above and that of the foot-

hills of the high mesa surrounding the La Sal Mountains. This is characterized by a number of low shrubs and under-shrubs as *Amelanchier utahensis*, *Cercocarpus montanus*, *Coleogyne*, *Petradoria*, *Yucca*, *Nuttallia*, *Fendlera*, *Ephedra*, *Gutierrezia*, *Cowania*, and some species of *Quercus*. The altitude was about 6,000 feet. About 1,000 feet higher these shrubs are replaced mostly by the cedar-pinyon formation. Both the cedar (*Sabina* or *Juniperus monosperma*) and the pinyon or nut-pine (*Pinus edulis*) are low scragly trees, usually 15 to 20 feet high. Within this formation

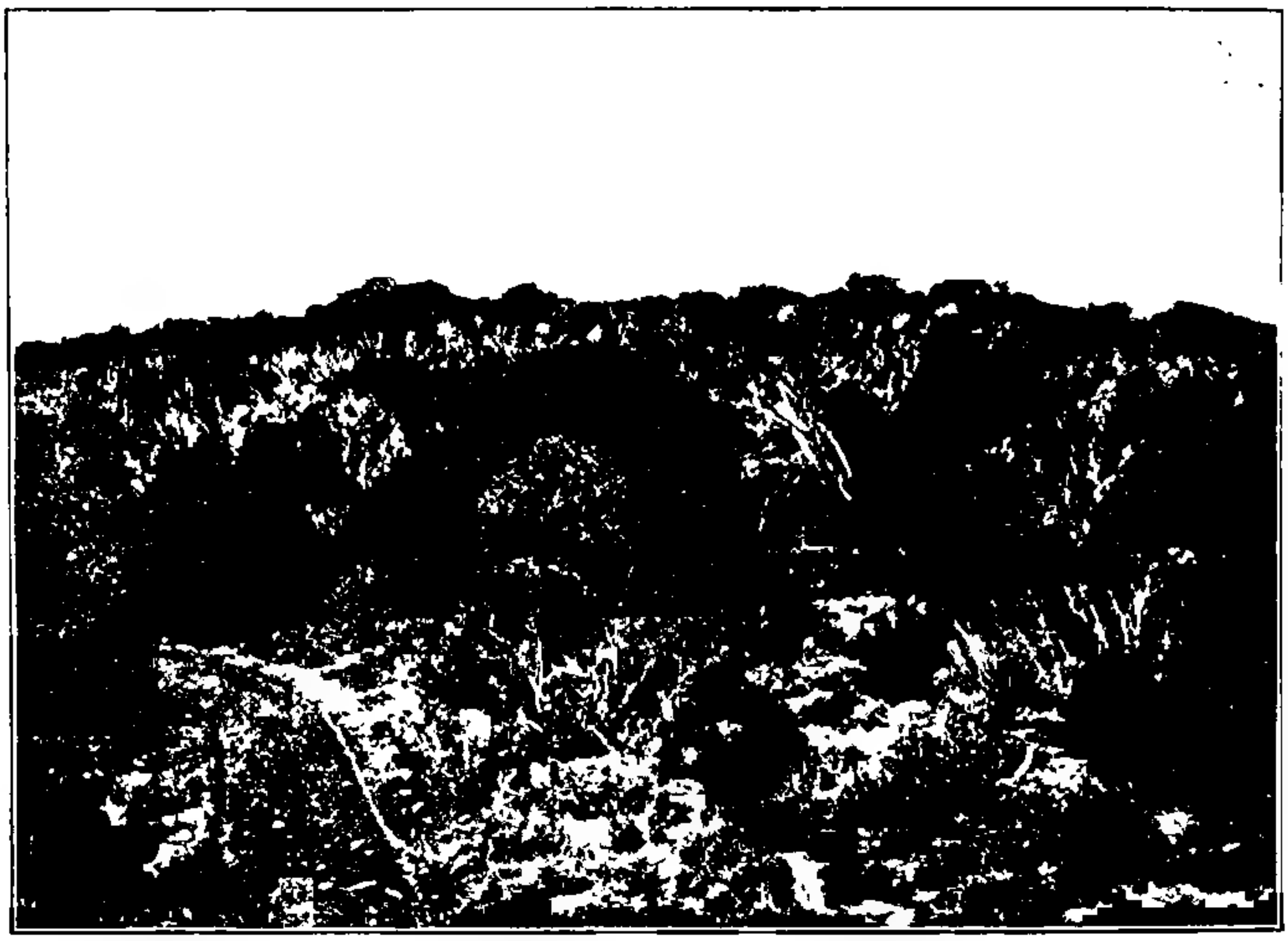

FIG. 35. "Cedar-pinyon formation" of the foot-hills of La Sal Mountains;—the dark trees are the cedars, the lighter ones the nut-pines.

at Little Springs, altitude 7,200 feet, we camped over night. Around this we collected a few hours and gathered several interesting plants, among them several species of *Stipa*. In the morning we continued our journey. A few hundred feet higher we reached the top of the mesa. Here the cedars and pinyons ceased. The photograph (fig. 35) was taken just where the road emerges from the cedars and pinyons. The dark trees are the cedars and the lighter ones the nut-pines. The mesa was

mostly covered by chaparrals. These consisted mostly of scrub-oaks, mixed with rose bushes and service-berries. Between 8,000 and 8,500 feet the land became more sloping as we neared the bases of the mountains proper. The chaparrals were replaced first by isolated groves and then by more continuous woods of aspen and at about 9,500 or a little more the spruce wood began. The illustration (fig. 36) shows an open valley in the aspen forest. The tall herbs in the foreground are *Dugaldia Hoopesii*, which made the whole valley yellow by its large flowers. To

FIG. 36. "Aspen formation" at the base of the La Sal Mountains; to the right a few outposts of the "spruce formation" above it.

the right are shown the first outposts of the spruce woods. These consisted of an almost pure stand of *Picea Engelmannii*, which was the principal tree lumbered at the sawmill situated a short distance from this place. The Engelmann spruce is here a very slow-growing tree. In a cut of a little over two feet in diameter, I counted some 260 annual rings.

The stamp-mill, owned by Mr. Clark and others and near which we had our camp in the old boarding-house, is situated in

the Gold Basin, in the central group of the La Sal Mountains. It is at an altitude of 10,000 feet. During out stay at this place, we collected for two days in the Gold Basin, two days in the spruce and aspen woods along Brumley Creek and on the upper extensions of the mesa below, one day on the northern slope, mostly in Horse Gulch, and three days we climbed the mountains above timber-line. The picture (fig. 37) shows the upper part of Gold Basin. In the foreground the timber-line is

FIG. 37. Upper part of Gold Basin, La Sal Mountains, showing timber-line in the foreground and one of the peaks in the background.

shown. In the basin itself the timber-line, on account of the deep snow, is much lower down (about 10,500 feet) than it is on the ridges, where the spruce extends up to 11,000 or a little higher. The flora of the spruce wood region, as well as the alpine vegetation, was very similar to that of the Rockies in central and southern Colorado. In the La Sal Mountains there is much slide

rock. The tops of the highest peaks are practically only a large mass of loose rocks. The picture (fig. 38) illustrates just one of the highest peaks. Of course, there is not much vegetation there, but these peaks are not wholly without plants. *Claytonia megarrhiza* I have never seen growing except between such rocks, and on top of Mt. Peal, the highest, the altitude of which according to the U. S. Geological Survey is 13,089 feet, we found

FIG. 38. Summit of one of the peaks in the La Sal Mountains, showing slide rock.

Polemonium confertum, *Erigeron trifidus*, *Arenaria obtusiloba*, etc.

On the 19th of July, we returned to Moab. The following two days we spent in fixing up the collections made, packing a big box of dry specimens and two smaller ones of live cactuses, and shipping them to New York. On the 22d, we took the stage for Monticello. The road runs first up the valley then crosses over a low divide into the valley, or rather canyon, of Cain's

Wash, then crossing a series of canyons and ridges, then over a desert plain, intersected by Hatch Wash, where the stages from Moab and Monticello meet. On this road, there is a stretch of over forty miles of country with no human habitation, except the stage owner's log cabin at Cain's Spring and a tent in the canyon where the road began to ascend the plateau on which Monticello is situated. In this tent lived an old man who took care of the animals at the station where the stage changed horses in the afternoon. The collection made on the road was meager. A few plants were picked up at this station and a few along the road where the driver was willing to stop.

Monticello is situated on a high plateau, at an altitude of 7,000 feet, seven miles east of Abajo Mountains. Some of the land around the town is irrigated from the branches of Montezuma River, and a small portion is under "dry farming," but a good deal is lying idle. The mesa is mostly covered with sagebrush and towards the mountains and where it is more broken or hilly with scrub-oaks, hawthorn, *Peraphyllum*, *Cercocarpus*, etc. Most of the land could be used for farming. The state has an experimental farm at Verdure, about six miles south of Monticello, and here were raised in 1910 under "dry farming" forty bushels of wheat to the acre. If we should judge from the rainfall this summer, we could say that irrigation was unnecessary. We stayed five days at Monticello this time, but had only one good day's collecting. On two other days we were out an hour or two between rains. It was very hard to take care of our plants, for there was little chance of drying our papers. As the wind was nearly always from the southwest and the rain began to fall as soon as the clouds struck the Abajo Mountains, we thought that if we were on the west side of those mountains, we would be out of the rain-belt. We, therefore, decided to make the trip to the Elk Mountains, which are situated west of the Abajo Mountains. We had intended to work the latter first and go to the Elk Mountains later. We rented two saddle-horses and four donkeys. Of the latter our guide rode one and the other three were packed with our tent, bedding, provisions, presses and other baggage. We found one of them too old and

too slow for making progress and when passing a Mexican's camp we rented two more donkeys and left the old white one with the Mexican.

Our trip took us around the southern end of the Abajo Mountains, crossing Verdure Creek, Johnson Creek, and Dry Wash to Allen Canyon. The most characteristic shrub on the ridges between Johnson Creek and Allen Canyon, was an *Amelanchier* with tomentose leaves and yellowish fruit, which was almost dry, even when ripe. Large stretches were covered by this bush. In other places were intermixed scrub-oaks, cedars, pinyons, mountain-mahogany and other shrubs. Along the streams were found willows, black-birches, alders, choke-cherries and poplars. The travel down Allen Canyon was very hard, as the recent rains had washed out the trail; in one place we could not cross the river and we had to climb the steep side of the canyon. It was almost impossible to get the donkeys up with their loads. Along the lower part of Allen Canyon we passed several Indian camps, with herds of goats. At our camp in the evening near Cottonwood Creek, we were visited by four Indians and the following day two young Indians overtook us and kindly put us on the right road. We had taken the trail leading up Cottonwood Canyon instead of Hammond Canyon, where the best trail leads up on the Elk Mountains. Even in Hammond Canyon we had a hard time, as we missed the trail leading up the south slope and followed the canyon almost to its head. The scenery here was grand; the most fantastic rocks were seen in form of spires, pillars, domes, animal heads, etc. The Elk Mountains are in reality a high table-land, 8,000 to 8,500 feet high. The top is flat, covered with grass and scattered bull-pines (*Pinus scopulorum*), and are used for summer pastures for thousands of cattle. The only real mountains are found at the southernmost end, two high knolls, of 9,400 and 9,500 feet altitude, known as the Bear's Ears (Orejos del Oso). The second day of August we were camped at the foot of these and investigated botanically the western of the two mountains. Its flora was rather interesting.

As the natural bridges, so renowned and well-described by

Professor Cummings of the University of Utah, were but ten miles away, we decided to make a trip to the White Canyon. Professor Garrett and myself rode over in the afternoon to Mr. Scorup's summer camp four miles away. We had been referred to Mr. Scorup by Mr. Cooper in Moab. Mr. Scorup not only gave us all the information which we needed, but in the morning rode over to the Bear's Ears and showed us from the pass between them, the way we should take. The direct

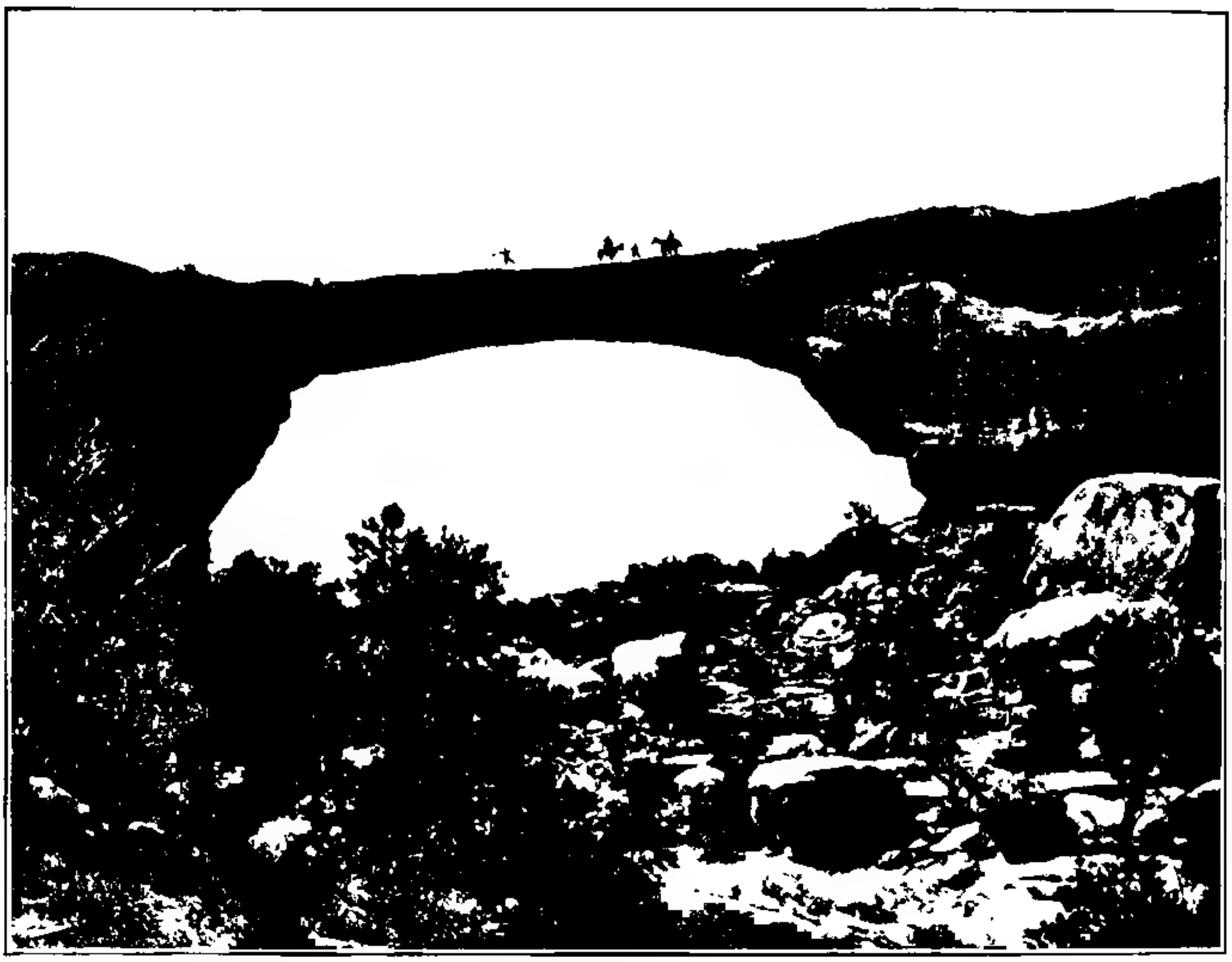

FIG. 39. Edwin Bridge in Armstrong Canyon.

trail is very precipitous and dangerous, but Mr. Scorup showed us a way, about twice as long, but easy to travel. After two steep hills and the crossing of a shallow canyon, the road was almost level through pinyon woods and sage-plains until we came to Armstrong Canyon, near the Edwin Bridge, a picture of which is shown (fig. 39). A steep trail led down into the canyon and we struck camp near the foot of the bridge. The photograph was taken from our camp. The bridge is 108 feet high, the span is 194 feet long, 15 feet thick, and 20 feet wide at the narrowest point.

On the following day, August 4th, we set out on foot to see the other two bridges and the ruins of the cliff-dwellers' houses of White Canyon. We traveled down Armstrong Canyon five miles. Just at the point where it empties into the White Canyon, the Carolyn Bridge spans the latter. It is much more massive than the Edwin Bridge, but is so crowded in among the cliffs that it does not give, by far, such an imposing impression. Its dimensions are: height of the arch under the bridge 98 feet, length 186 feet, thickness of span 107 feet and width 49 feet.

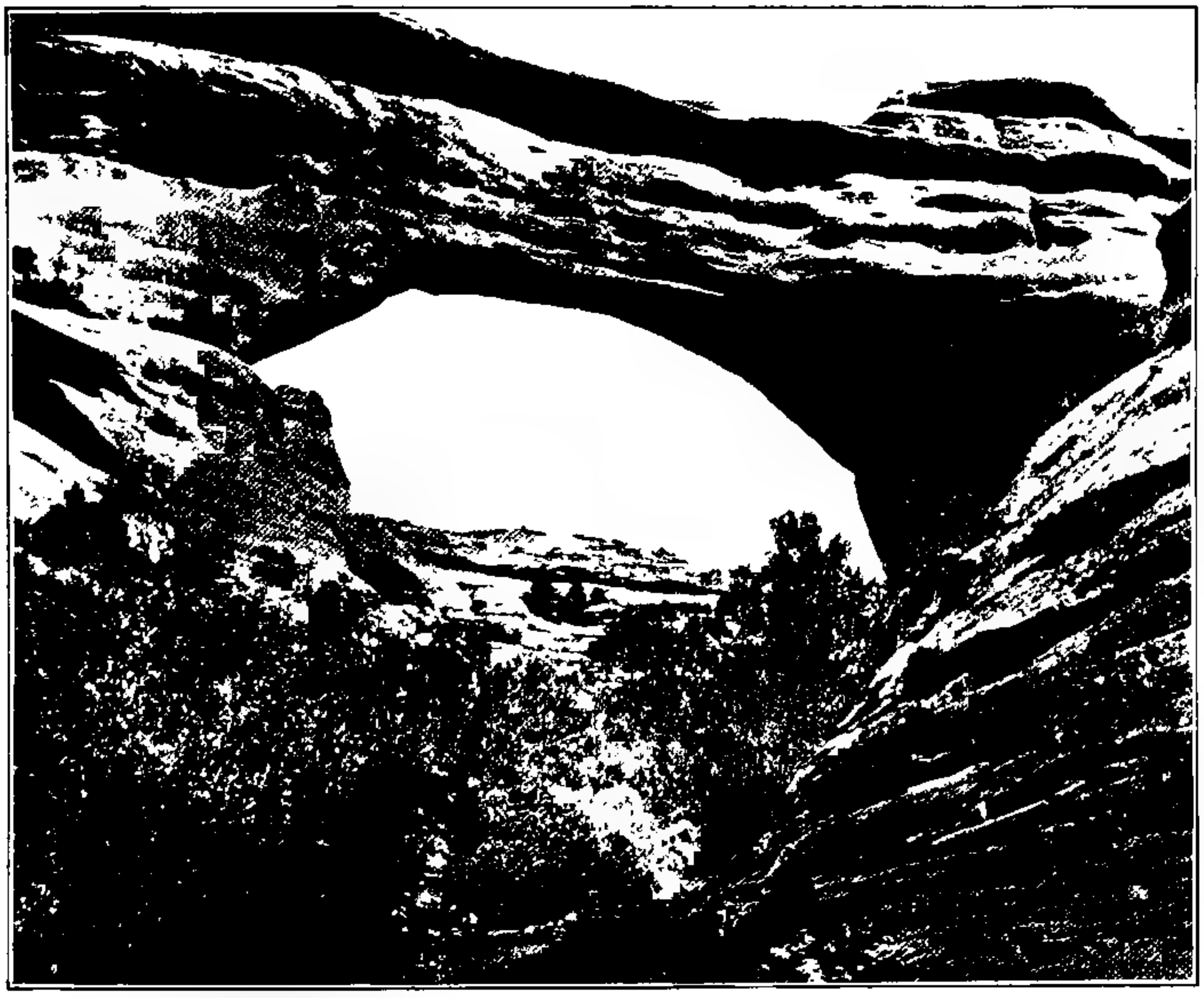

FIG. 40. Augusta Bridge in White Canyon.

The grandest of them all is the Augusta Bridge, in White Canyon $3\frac{1}{2}$ miles above the Carolyn Bridge. The arch is 157 feet high and 261 feet long. The top of the bridge is 222 feet over the creek bed. As it spans the main canyon and is in full view for some distance, its grandeur is fully appreciated (fig. 40).

Along the sides of the White Canyon we saw several cliff-dwellers' ruins, but the best one was found about a mile above the big bridge. After seeing these we returned to camp.

We had made the side trip to the White Canyon, principally in order to see these remarkable bridges, compared with which the one in Virginia is almost nothing, but we found that the flora was very interesting and decided to stay for a few days' collecting. Armstrong Canyon turned out to be one of the best collecting grounds we had on our trip. At least one plant, a species of *Anticlea*, is new to science.

FIG. 41. Two small cliff-dwellers' houses.

On our return trip we stopped over a day collecting in Mr. Scorup's pasture, the only part of the Elk Mountains that had not been grazed over so thoroughly by cattle, and hence had kept more than other parts its original flora. We owe Mr. Scorup thanks for all the favors shown us. Thanks are also due Nielson Brothers. On returning to Monticello, we took another route in part. We took the usual trail down the south slope of Hammond Canyon, down the lower part of the same and up Dry Wash. On Cottonwood Creek at the crossing we found unusally large cottonwoods (*Populus acuminata*). One of these measured 14 feet in circumference. Near the head of Dry Wash we found one of our best collecting grounds.

We arrived at Monticello August 13th, which was a Saturday. On the following Monday we made a collecting trip eastward from town extending into the Montezuma Canyon. On Tuesday we secured a team which took us up to the Abajo Mountains or as they are oftener called the Blue Mountains, and camped near Mr. Innes' sawmill. The Abajo Mountains are much lower than the La Sal Mountains, the highest point reached being a little over 11,000 feet. In other words, they reach to about timber-line and only a few alpine plants were found on the very summits. On the eastern side, the slopes are covered first with scrub-oaks and bull-pines (*Pinus scopulorum*), higher up with aspen and Engelmann spruce. The northern slopes are more wooded. The wood consists mostly of Engelmann spruce mixed with Douglas fir. The southern slopes are mostly treeless and covered by a coarse bunch-grass, *Festuca arizonica*. From this it appears that the Abajo Mountains, although further away, have a woody flora more like that of the mountains of Colorado than the La Sal Mountains. In the part we visited of the latter, we saw neither the Douglas fir nor the bull-pine and a man at the sawmill there, who was more intelligent than the lumbermen in general and knew all the forest trees of the Rockies and of Oregon, told me that they were not there. The herbaceous flora of the Abajo Mountains was also strictly Rocky Mountain. We were greatly surprised in finding *Adoxa* and *Trautvetteria* there. On August 24th, Mr. Innes kindly took us down to Monticello.

The following day, Professor Garrett returned to Salt Lake City, where his school was to open on the next Monday. I took the stage to Bluffs, forty-seven miles away. The road between Monticello and Grayson led across several deep canyons and passed mostly through the scrub-oak and cedar-pinyon belts. From Grayson to near Bluffs it led over table-lands, first covered by more or less scattered sage-brush; further south this was supplanted by the black-bush, *Coleogyne*, and other shrubs.

Towards San Juan River the land became more sandy, and shrubby species of *Eriogonum* became more common. A mile or two from Bluffs the road entered a canyon, leading steeply

down from the table-land. The canyon opened suddenly into the valley of San Juan River. At this place the river valley is bordered on both sides by almost perpendicular walls of, I judge, about 300 feet. These high walls or bluffs give the name to the town of Bluffs. On the north side at short distances between, shorter or longer box canyons run from the San Juan Valley into the table-land. One of these box canyons is illustrated (fig.

FIG. 42. Box canyon in the bluffs north of San Juan River, with alcoves.

42). The canyons and their branches often end in alcove-like cavities with over-hanging rocks. Under these rocks are usually found a species of *Mimulus* growing in the crevices, sometimes even under the ceiling of the alcove. After blooming the plant sends out runners like the strawberry, but these runners grow in all directions, up or down or horizontally. Wherever they touch the rock and can find a cervice, they strike root. If this happens to take place in the ceiling, the new plant formed at the place will grow with the root up and the flower down. In the crevices and in the loose soil and gravel under this *Mimulus*, I often found growing *Aquilegia micrantha*, a *Primula*, a *Lim-*

norchis, *Epipactis gigantea*, an *Oenothera* and two species of *Carduus*. One of the latter is evidently new to science. I also collected in San Juan Valley, as far as twelve miles in either direction and on top of the table-land, north of the river, and gathered many interesting plants. The flora is more like that of Arizona than that of the rest of Utah.

On August 30th, I took the stage northward and homeward. I stopped a single day at Moab to gather up some baggage and plants stored there and to pack my things for the railroad journey. On my trip home I stopped a few days each at the following places: at Denver to call on the Colorado botanists, Bethel, Ramaley, Cockerell and Osterhout; at Lincoln and Wahoo, Nebraska, my old homes, to visit old friends, and at St. Louis to study on the collection of *Rosaceae* at the Missouri Botanical Garden. I extend thanks to Dr. Trelease and Mr. Craig for many courtesies and help given.

The result of the exploration cannot be given now, as the plants have not been determined. The collection contains many interesting and rare plants, as the region was practically a virgin field, only two botanists having visited it before and each only for a short time. Our collection contains nearly 6,000 sheets, representing 1,740 numbers of phanerogams, about 50 fungi and a few mosses and lichens. As some species were duplicated, being collected at more than one station, the number of species is somewhat less. My estimate is somewhat over 1,000 species.

Respectfully submitted,

P. A. RYDBERG,

Curator.

EXPLORATION IN THE SOUTHWESTERN STATES AND WEST COAST OF MEXICO.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF.

Sir: In order to obtain certain botanical specimens desired by the New York Botanical Garden and the National Museum I was authorized February, 1910, by Dr. Richard Rathbun, Assistant Secretary of the Smithsonian Institution, to visit the

southwestern states and the west coast of Mexico. I accordingly started from Washington, D. C., on the 19th of February with Mr. P C. Standley and Mr. Paul Russell as assistants, and returned about the first of May.

Field work was begun at Big Spring, Texas, where a beautiful new *Echinocereus* was gathered along with other curious desert plants. Short stops were made at Sierra Blanca and El Paso, Texas, Agricultural College, New Mexico, and Benson, Arizona, where about 130 plants, many of them cactuses, were collected.

On the morning of March 3 we arrived at Hermosillo, the capital and principal town of Sonora, Mexico. It is in a fertile green valley filled with orange groves and grain fields; but the hills are deserts of the real kind and here it was that we spent most of our time. During the six days at Hermosillo we collected about 300 species, including several cactuses. The most interesting cactuses were *Opuntia gosselliana* with its highly colored joints and very long porrect spines and the very rare little *Mamillaria mainae*.

We then proceeded to Guaymas, which is on the Gulf of California. Here we collected numerous cactuses from tiny Mamillarias to the giant "cardons," of which there are two in this vicinity, viz., *Pachycereus pecten-aboriginum* and *P. pringlei*.

Carnegiea gigantea, the giant cactus of Arizona, is also to be found on the neighboring hills. This species we afterwards traced southward to the hills bordering the valley of the Yaqui River. It was not seen south of this river and I am inclined to believe that this is its southernmost limit.

From Guaymas we proceeded by train to Alamos, where we remained about a week, making daily excursions over the lower hills or up the side of Alamos Mountain which is near the town. I was much surprised to find here a *Cephalocereus*, but the species has not yet been determined. About 475 species were collected.

A night and a part of the next day were spent at Navajoa, where we changed cars for the Southern Pacific Railroad. We then proceeded south to San Blas which is the junction of the Southern Pacific and Kansas City and Orient roads. With San Blas as a base we collected on all the neighboring hills, thence

taking the train for Topolobampo, which is the seaport for San Blas. Returning to San Blas we went in the other direction to Fuerte, which was then the eastern end of the Pacific branch of the Kansas City and Orient Railroad. At San Blas we were the guest of E. A. H. Tays, a progressive mining engineer, who is alive to the development of western Mexico. He has since sent us some interesting plants from the mountains east of San Blas.

We then proceeded to Mazatlan, the principal seaport of Sinaloa and a most charming place to visit. From here we made trips to the mangrove swamps, to the sandy sea beaches, and to hills adjoining the sea and those east of the city. Here we found a varied and interesting flora. The cactus display, while not so overshadowing as at other places along the coast, was extremely interesting. Here we found an undescribed *Cephalocereus*, *Mamillaria mazatlanensis* and *Cereus vagans* only known from these hills near the ocean, *Rathbunia kerberi* growing as a clumsy vine, several strange species of *Opuntia*, and other like plants.

We also made excursions to Presidio or El Union, Rosario, Palmar and Acaponeta to the south, and Guadalupe to the north. From all these places an abundance of material was collected. At Acaponeta and Palmar are large forests of the beautiful palm *Inodes rosei*, a species well worthy of cultivation as an ornamental. This tree is of great economic value to the natives, who use the leaves to thatch their rude huts, and for hats, mats, and various other uses. Growing along with this palm I found a second species which seems to be undescribed.

We then retraced our steps northward to Culiacan, now the center of a great irrigating enterprise. On the dry hills were many strange plants, the most striking and interesting of which proved to be a new genus, *Erioxylum*, a near relative of the cotton plant. It was common along the railroad all the way from the hills north of Mazatlan nearly to Culiacan, but had an aggravating way of dropping out of the flora where stops were made. We had hoped to collect it at Guadalupe but could not find it near the town and only found it at Culiacan after an exhaustive tramp southward, just as we were planning to retrace our footsteps to that place.

From Culiacan we went by rail to Altata which is on the coast, but little of interest was found outside of the sand-loving plants.

On May 23 we were again in Guaymas, where a day was spent visiting some neighboring ranches and a rocky island in the harbor. April 24 we arrived at Magdalena, also in Sonora, where we spent a day. We then left for Tucson where we closed our field work and returned to Washington.

The results were a collection of 10,000 herbarium specimens, representing 3,000 numbers, besides numerous living specimens of succulents, chiefly cactuses. A set of the living and herbarium specimens has been deposited in the New York Botanical Garden.

The funds for the expedition were furnished by the New York Botanical Garden, the Desert Laboratory of the Carnegie Institution, and the U. S. National Museum.

ITINERARY OF BOTANICAL EXPEDITION TO THE WEST COAST OF MEXICO.

Places visited.	*Arrival.*	*Departure.*
Big Springs, Texas.	Feb. 23	Feb. 23.
Sierra Blanca, Texas.	Feb. 24.	Feb. 25.
El Paso, Texas.	Feb. 25.	Feb. 27.
Agricultural College, N. Mexico.	Feb. 28.	Feb. 28.
El Paso, Texas.	March 1.	March 1.
Benson, Arizona.	March 2.	March 3.
Hermosillo, Sonora.	March 4.	March 9.
Guaymas, Sonora.	March 10.	March 10.
Empalme, Sonora.	March 11.	March 11.
Alamos, Sonora.	March 13.	March 21.
Navajoa, Sonora.	March 21.	March 22.
San Blas, Sinaloa.	March 22.	March 29.
Topolobampo, Sinaloa.	March 23.	March 24.
Fuerte, Sinaloa.	March 25.	March 28.
Mazatlan, Sinaloa.	March 30.	April 9.
Acaponeta, Tepic.	April 9.	April 12.
Rosario, Sinaloa.	April 14.	April 15.
Palmar, Sinaloa.	April 15.	April 15.
Guadalupe, Sinaloa.	April 18.	April 19.
Altata, Sinaloa.	April 20.	April 20.
Culiacan, Sinaloa.	April 21.	April 22.
Guaymas, Sonora.	April 23.	April 24.
Magdalena, Sonora.	April 25.	April 26.
Tucson, Arizona.	April 26.	April 27.

J. N. ROSE.

NOTES, NEWS AND COMMENT.

Dr. W. L. Johannsen, professor of plant physiology in the University of Copenhagen, who has been delivering a course of lectures in Columbia University on "The Modern Principles of Heredity" was a recent visitor at the Garden.

Recent reports from Dr. W. A. Murrill as to the conditions for fleshy fungi on the Pacific coast are most favorable and the trip will result in the addition of many interesting species to the mycological herbarium.

The second meeting of the Torrey Botanical Club for this season was held in the main laboratory of the museum building of the Garden, October 25. The meeting consisted of informal reports by a number of the members.

Dr. E. D. Clark, instructor in biological chemistry in Columbia University, has been awarded a research scholarship at the Garden to assist him in carrying on some investigations in certain phases of plant chemistry.

The first of the autumn conferences was held in the main laboratory of the museum building on Monday, November 6. A full account of this meeting will appear in a later number of the JOURNAL.

Dr. William H. Brown, a student at the tropical laboratory during the summer of 1910, has recently been appointed plant physiologist in the Philippine Bureau of Science, Manila.

The Control of the Chestnut Bark Disease is treated by Haven Metcalf and J. F. Collins in farmers bulletin No. 467 issued by the United States Department of Agriculture, October 28, 1911.

The total financial loss from this disease is now estimated at $25,000,000. The only known practical means of controlling the disease in a forest is to locate and destroy the advance infections as soon as they appear. Advance infections should be located by trained observers and destroyed by cutting and burning. Chestnut nursery stock should be rigidly inspected and only perfectly healthy plants passed. The life of valuable orna-

mental trees may be greatly prolonged by promptly cutting out all diseased parts and covering cuts with tar. Spraying is of no use in stopping the fungus after it is once started. Diseased chestnut trees should be cut down and utilized as soon as possible. For the present the planting of chestnuts anywhere east of Ohio is not advised, but there is no apparent reason why chestnut orchards west of Ohio cannot be kept free from the disease.

Meteorology for October.—The total precipitation for the month was 4.95 inches. Maximum temperatures were recorded of 75° on the 16th, 74.5° on the 10th, 72° on the 4th and 67° on the 23d. Also minimum temperatures were recorded of 48° on the 21st, 36° on the 13th, 35.5° on the 8th, and 30° on the 29th. The first killing frost of the season occurred on the 29th.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

10 specimens of polypores from Oxford, Ohio. (By exchange with Mr. T. O. Overholtz.)

7 specimens of mosses from Wisconsin. (Given by Mr. A. B. Stout.)

2 specimens of hepatics from Europe. (By exchange with Professor István Györrffy.)

1 specimen of *Tetraphidopsis novae-seelandiae* Broth. & Dixon. (By exchange with Mr. H. M. Dixon.)

101 specimens of plants from the South Pacific Islands. (Distributed by Miss Josephine Tilden.)

4 specimens of *Riccia* from Connecticut. (Given by Miss C. C. Haynes.)

6,000 specimens of flowering plants and ferns from southeastern Utah. (Collected by Dr. P. A. Rydberg.)

17 specimens of drugs. (Given by Dr. H. H. Rusby.)

14 specimens of flowering plants from Alabama. (Given by Dr. R. M. Harper.)

PLANTS AND SEEDS.

1 plant of *Oncidium Papilio.* (Given by Mrs. Miller.)

4 plants of *Livistona chinensis.* (Given by Mr. A. Heckscher.)

12 cactus cuttings. (By exchange with Royal Gardens, Kew, England.)

2 plants for the conservatories. (Given by Mr. J. W. Grant.)

19 orchids for conservatories. (By exchange with Mr. J. A. Manda.)

2 oleanders. (Given by Mr. C. Jones.)

1 plant of *Crinum.* (Given by Miss Grace Simonson.)

3 cuttings of a *Pedilanthus*, from Mexico. (Given by Mr. Weeks.)

8 plants for the conservatories. (Given by Mr. J. B. Lazzari.)
1 lemon tree. (Given by Miss E. Richard.)
6 plants of *Aponogeton distachyum*. (By exchange with Mr. H. A. Dreer.)
5 plants from British Guiana. (Given by Mr. F. E. Lutz.)
25 orchids for conservatories. (By exchange with Mrs. B. B. Tuttle.)
7 cactus plants from Utah. (Collected by Dr. P. A. Rydberg.)
3 plants of *Artemisia* for herbaceous grounds. (Given by Mr. A. Buchholz.)
1 plant of *Beaucarnea recurvata*. (Given by Mr. L. Bernard.)
19 plants for nurseries and conservatories. (Given by Mrs. A. P. Morosini.)
53 cactus plants and other succulents for conservatories. (By exchange with U. S. National Museum, through Dr. J. N. Rose.)
20,950 bulbs for decorative plantations. (Purchased.)
595 plants for decorative plantations. (Purchased.)
2 packets *Betula* seed from Vermont. (Given by Mr. W. H. Blanchard.)
5 packets seed. (Given by Mr. E. Bethel.)
1 packet of seed. (Given by Dr. H. H. Rusby.)
5 packets of seed. (By exchange with Insular Bureau of Agriculture, Manila, P. I.)

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JOURNAL

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EXPLORATION IN LOWER CALIFORNIA.

DR. N. L. BRITTON, DIRECTOR-IN-CHIEF,

Sir: On February 19, 1911, I left Washington to embark upon the U. S. Steamer "Albatross" which was about to start for a scientific cruise along the coast of Lower California. The expedition was organized by Dr. C. H. Townsend, then acting director of the American Museum of Natural History, and I had been invited to accompany him and collect plants for the New York Botanical Garden and for the U. S. National Museum.

The "Albatross," a ship belonging to the Bureau of Fisheries, is splendidly suited for exploration work with its laboratory, library, and all kinds of equipment, but is especially fitted out for deep sea work. The ship was in charge of Commander Guy H. Burrage, an able officer who was in deep sympathy with our work, while Lieut. B. G. Barthalow, a capable navigator and accommodating executive officer, was second in command. These two with other officers and men and our eight naturalists and collectors made up a party of eighty.

The program of the trip as planned and carried out was to go down the west coast of Lower California and then into the Gulf of California about two thirds its length, visiting as many places on the mainland and islands as time would permit.

On February 28, we steamed out of San Diego harbor for Guadalupe Island. This island is well known to botanists, having been visited by Dr. Edward Palmer in 1875, at which time he collected many new species. I had expected to re-collect many of these species, but my visit was somewhat disappointing.

The ship spent three days near the island but owing to rough seas I spent only two days ashore. There evidently had been considerable rain, for many of the hills and rock slides were green, but the number of interesting species seen were very few, the vegetation consisting largely of native and introduced weeds. This is due to the fact that the island is overrun by goats which have destroyed many of the native plants. The rare palm (*Brahea guadalupensis*) which is only known from this island was not seen, although stumps, some a foot in diameter, were passed in the canyons which showed plainly that they had been gnawed down by the goats.

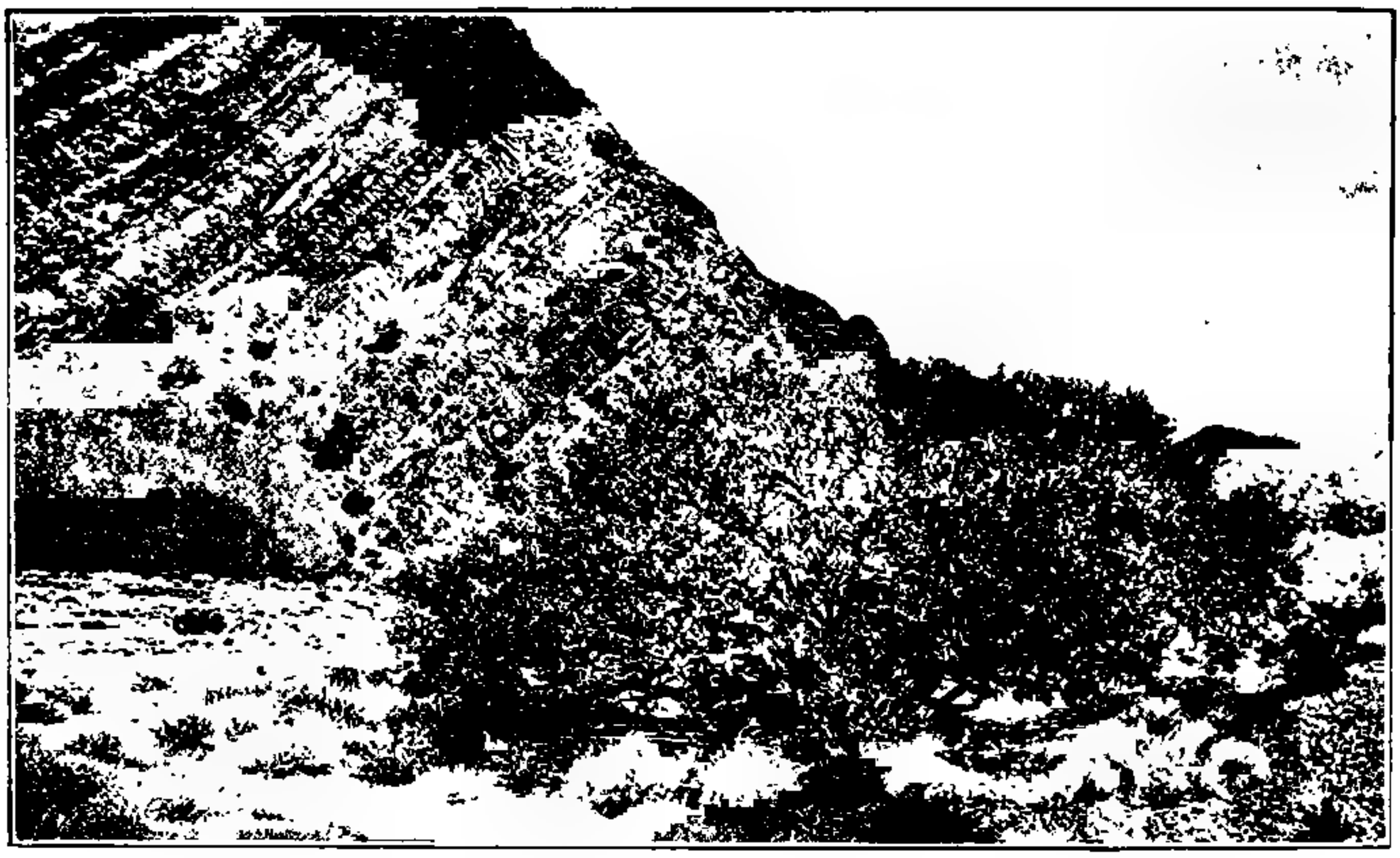

FIG. 43. View on Cedros Island, a *Rhus* in the foreground.

High up in the canyons were a few live-oaks (*Quercus tomentella*), some with a trunk two feet in diameter. These often grow down in the bed of the canyon where great boulders, brought down by the mountain torrents, are dashed against the trunks, peeling off the bark and scarring them up generally. Two California poppies were seen growing in close proximity, but certainly distinct. One was the beautiful *Eschscholtzia frutescens* which is well worthy of cultivation as an ornamental plant, but unfortunately it was only in flower and no seeds could be obtained. Only one cactus was seen and that an *Opuntia* of the

O. prolifera type. It was very common in the lower part of the island, often forming small thickets.

On March 9, landings were made on both the west and the east islands of the San Benito group. West San Benito Island has been collected upon by Commander Pond and Dr. Edward Palmer, but so far as I know no collections have been made from East San Benito. Four cactuses, an *Agave*, and a *Dudleya* were the most interesting succulents obtained. March 10, 11, and 12, were spent on Cedros Island and three landings were made, one on the south end and two along the east shore. About 100 species were collected, including five species of cactuses, two of *Dudleya*, and an *Agave*.

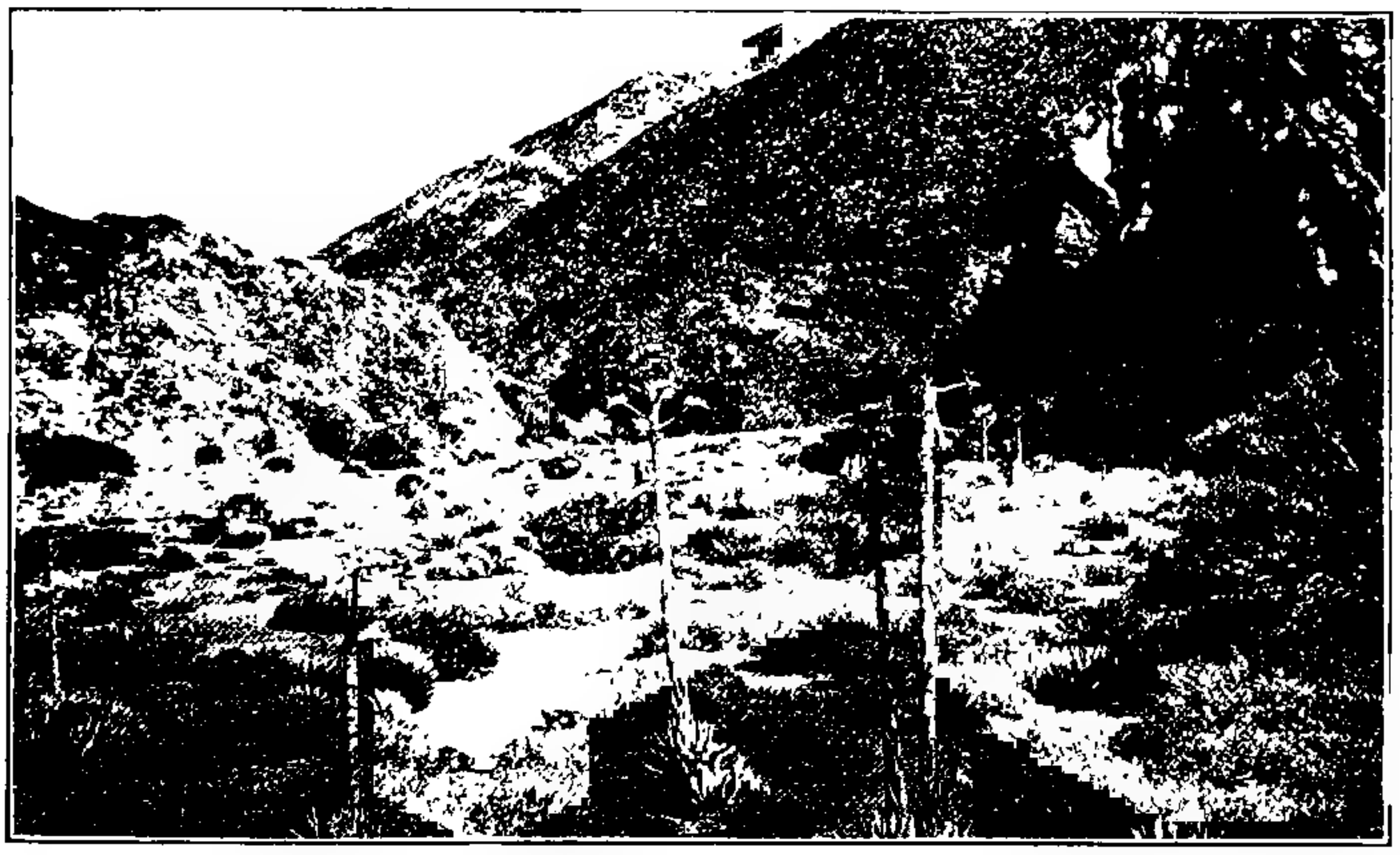

FIG. 44. Valley on Cedros Island with *Agave sebastiana* and other desert plants.

On March 13 and 14 we were in San Bartolomé Bay, where a small collection was made, including 4 species of cactuses, one *Dudleya*, one *Agave*, and one *Yucca*.

On our way south a stop of an hour was made at San Roque, a bird island upon which no flowering plants have yet become established and where nothing was obtained except three rock lichens.

One day was spent at Abrejos Point, which is surrounded by salt flats and sandy plains divided by long salt-water lagoons.

The sailing charts show "sage-brush flats," but nothing of this kind is to be found. The only growing things on the sandy plains were the seedlings of some wild onion (*Allium* sp.), which gave a decided green color to the otherwise brown sand. On the low hills some three miles back three cactuses were collected.

Two landings were made on Magdalena Island, the first on the ocean side at Santa Maria Bay and the second on the bay side near the village of Magdalena. On this island Mr. T. S. Brandegee landed in January, 1888, and found it a veritable flower garden, but now it was like a parched desert, for the island had been long without rain, how long we did not learn. On Margarita, a neighboring island, we were told that there had been no rain for six years. The numerous dead cactuses and other succulents clearly indicated that there had been a long drought. Only a few desert shrubs were in flower. The most remarkable of these was an evening primrose (referred to *Gongylocarpus* by Mr. Brandegee, but probably wrongly) which grew as a large depressed bush covered with lavender-colored flowers. The tips of the flowering stems were purple and swollen as if they had been stung by some insect, but careful inspection showed that this form is natural and is produced by the imbedded ovaries. At Santa Maria Bay especially there was a rich display of succulents, ten cactuses being found within a stone's throw of the beach. An *Agave* was also very common.

Two landings were made at different points on Santa Margarita Island, but little difference was seen in the vegetation as compared with that of Magdalena. An *Opuntia* somewhat different from the one on Magdalena was common and this has been made a distinct variety *pycnantha* by Dr. J. M. Coulter. A giant cactus not seen on the other island, though perhaps to be found there also, was frequent but not common.

On March 23, we reached Cape San Lucas, the extreme southern tip of the Peninsula, where we remained two days. To the east of the Cape is a fairly good landing. Historically, this is one of the most interesting botanical localities in Lower California. Here it was that Hinds made a large collection of cac-

tuses in 1839, but his entire collection died en route to England. Again it was here that L. J. Xantus, a bird collector, spent many months in 1859–60. His plant collection of 121 species formed the basis of a paper by Dr. Asa Gray in which 25 species were described as new. Nothing further was learned of these species for nearly a half century. In 1889, Mr. T. S. Brandegee rediscovered many of them, but generally in more northern localities. During my two days' stay I collected over 100 species, doubtless most of those obtained by Xantus, besides quite a number of other species not before reported from here. The season was extremely dry and practically no annuals were found. The cactus display was more varied than in any other locality. Thirteen species were obtained in one morning's walk. Among other interesting succulents were an *Agave*, a *Yucca*, and a *Dudleya*.

From Cape San Lucas we proceeded to San José del Cabo, also near the southern end of the Peninsula but to the east of Cape San Lucas. I was somewhat disappointed with this place, partly due perhaps to the fact that the flora is very similar to that of Cape San Lucas. Among the interesting succulents was a *Hechtia*, perhaps new to Lower California.

We then proceeded to the United States coaling station near La Paz, situated on Pichilinque Island. On this island also are situated large salt works. The few families who live on the island keep goats and these animals have eaten up all the annual and low vegetation. Four species of cactuses, however, were common and a remarkable species of *Fouquieria*, which is undoubtedly new.* The following day I visited the Peninsula proper where

* **Fouquieria Burragei** Rose, sp. nov.

A large spreading shrub, 3 to 7 meters high with a short but definite trunk; branches wand-like; inflorescence an elongated panicle resembling an interrupted raceme or spike, 10 to 35 cm. long; flowers very small, subsessile; sepals orbicular, purplish, 4 mm. long, obtuse; corolla pale purple to nearly white, the lobes orbicular, obtuse, 5 mm. long; filaments pale, terete, glabrous below and above but very hairy in the middle third; capsule 15 mm. long.

Collected by J. N. Rose on Pichilinque Island near La Paz and on the Lower California mainland. This species is very different from *F. peninsularis*, the common species near La Paz. It is much nearer to the Mexican *F. campanulata* than to the latter, but with still smaller flowers, etc. Named for Commander Burrage whose interest in our work has been mentioned above.

I again found this *Fouquieria*. It was practically past flowering, while another species nearer La Paz was in full flower. The same day I found on the high hill back from the bay what appears to be a new species of *Mamillaria*, and a most interesting new *Agave*, which, however, was not in flower. The next day was spent nearer La Paz, where I collected still another undescribed *Agave*. I had collected the same near La Paz in 1897 but at neither time was it in flower. A fine display of cactuses was seen in all the low lands about La Paz.

FIG. 45. "Palo Blanco" tree at Agua Verde Bay, Lower California.

We then proceeded northward to San Josef, a very dry and barren island where little material was collected save 13 species of cactuses. Parts of two days were given to collecting.

The next stop was at Agua Verde Bay. Here there is a small settlement and a stock ranch and this is also one of the places from which tan bark is shipped. This is furnished by a tree called "palo blanco" (*Lysiloma candida*), which is very common throughout southern Lower California. Eight species of cactuses were collected.

From this place we proceeded to Carmen Island, where there is a large dry salt lake from which is obtained the well known Carmen salt. Dr. Edward Palmer made collections on this

island in 1870 and again in 1890. A report on the latter collection was published in the Contributions from the U. S. National Herbarium, volume one. Ten species of cactuses were collected, the most interesting of which was *Echinocactus Diguetii*. Large plants six feet high were common growing along the old beach of the lake. The plants were sitting so lightly upon the shells that they could easily be toppled over by one's foot.

From Carmen Island we proceeded north to Mulege on the peninsula proper, at the mouth of Concepcion Bay, where a short

FIG. 46. "Palo Blanco" bark ready for shipment.

stop was made. Thence we moved up to the head of the bay, where a stop of two days was made, another being made on our way out half-way down the bay. All the country about Concepcion Bay is a veritable desert and only about 75 plants were collected, of which 12 or more were cactuses. Some of the latter were extremely interesting. One large *Echinocactus** is much used in making candy. It is represented in the type collection only by a cluster of spines. Mulage, a small Mexican town, is on a little stream which furnishes water for the irrigation of many gardens, where all kinds of tropical fruit and vegetables are grown.

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* *Echinocactus rectospinus* (Coult.) Britton & Rose. *Echinocactus Emoryi rectospinus* Engelm. in Coult. Contr. Nat. Herb. 3: 362. 1896.

At San Francisquito we spent only one night and only a few hours were given to shore work. This proved to be a very interesting station and although extremely dry many curious plants were found to interest me. The cactus display was very remarkable. At this place I found the strange *Opuntia invicta*, which

FIG. 47. Large plant of *Echinocactus Diguetii* on the shore of Santa Catalina Island.

does not at all suggest an *Opuntia* but was taken to be an *Echinocereus*. Nine species of cactuses were collected.

The next stop was at Angel de la Guardia, the largest island in the Gulf, which is the most barren region I have ever seen, unless it were a sandy waste or an alkali flat. The island is

inhabited by giant lizards and rattlesnakes which made it, to some members of our party, a real paradise.

We then passed over to Tiburon Island. The flora of this island is of Sonoran origin. Here we found the giant cereus (*Carnegiea gigantea*) for the first and only time.

Two short landings were made at San Estaban, where some fine cactus specimens were collected, some of which are undescribed.

At Catalina Island we spent several hours although the vessel did not cast anchor. This island is the type locality of *Echinocactus Diguetii*, the giant cactus among the barrel-cactuses. Plants 10 to 12 feet high are common, while plants 15 feet high are occasionally seen. One plant was measured which was 88 inches in circumference. This plant is the most characteristic plant on the island, dotting the hillsides and valleys everywhere. Five other cactuses were gathered. Later the same day we were dropped off at Santa Cruz Island while the vessel drifted down the Gulf, returning to pick us up at sundown. The two hours on the island were very busy ones, spent in noting the various cactuses, of which I saw ten. A most interesting *Mamillaria*, not seen elsewhere, was common, forming large clumps, its surface densely covered with snowy white spines. Two days were spent in coaling the ship at Pichilinque Island. The day before the ship left four of our party took a launch and went over to Espiritu Santo Island, where we were picked up the next morning by the "Albatross." The island is the headquarters of the pearl fisheries of the Gulf. As at all settlements in Lower California, goats are here in abundance and the native vegetation has consequently suffered.

Our last collecting was done on Ceralbo Island just before we left the Gulf. Only two hours were spent on this extremely interesting island, which deserves a most careful survey. Like Catalina and Santa Cruz, it is uninhabited and has not been interfered with in any way by man or domestic animals.

The botanical results of the trip were extremely satisfactory. Two sets of 900 plants each were collected. This is not a large collection to make in two months under ordinary circumstances, but it must be remembered that we were in a desert country,

part of which was overrun by goats and in no part of which had there been rain for months, in some places not even for years. The trip was made chiefly for the purpose of gathering the cactuses of the region, many of which are endemic species. Nearly half a carload of living plants was sent back to New York, which reached their destination in nearly perfect condition.

The photographs here used are furnished through the courtesy of Dr. C. H. Townsend.

The following table shows our itinerary in detail:

ITINERARY OF SCIENTIFIC EXPEDITION TO THE GULF OF CALIFORNIA.

Ports Visited.	Arrival.	Departure.
San Diego	Feb. 25, 12:30 p. m.	Feb. 25, 5:00 p. m.
Guadalupe Island	Mar. 2, 7:55 a. m.	Mar. 5, 5:25 p. m.
San Diego	Mar. 6, 6:15 a. m.	Mar. 7, 9:00 p. m.
San Benito Islands	Mar. 9, 8:30 a. m.	Mar. 10, 5:30 a. m.
Cedros Island	Mar. 10, 8:45 a. m.	Mar. 12, 6:25 a. m.
San Bartolomé Bay	Mar. 13, 12:05 a. m.	Mar. 15, 5:23 a. m.
San Cristobal Bay	Mar. 15, 9:43 a. m.	Mar. 15, 11:26 a. m.
San Roque Island	Mar. 15, 5:04 p. m.	Mar. 15, 7:30 p. m.
Abrejos Anchorage	Mar. 16, 7:00 a. m.	Mar. 16, 5:42 p. m.
Santa Maria Bay	Mar. 18, 6:55 a. m.	Mar. 18, 5:30 p. m.
Magdalena Bay	Mar. 18, 9:53 p. m.	Mar. 19, 10:00 a. m.
Santa Margarita Island	Mar. 19, 12:19 p. m.	Mar. 20, 6:23 a. m.
Marcy Channel	Mar. 20, 7:20 a. m.	Mar. 21, 7:00 p. m.
Cape San Lucas	Mar. 23, 5:41 a. m.	Mar. 25, 6:15 a. m.
San José del Cabe	Mar. 25, 9:00 a. m.	Mar. 26, 4:50 p. m.
Pichilinque	Mar. 27, 11:30 a. m.	Mar. 30, 9:08 a. m.
San Josef Island	Mar. 30, 4:12 p. m.	April 1, 6:30 a. m.
Agua Verde Bay	April 1, 2:45 p. m.	April 2, 11:00 a. m.
Carmen Island	April 2, 3:32 p. m.	April 3, 4:22 p. m.
Mulege	April 4, 7:00 a. m.	April 5, 8:00 a. m.
Concepcion Bay	April 5, 11:52 a. m.	April 8, 8:30 p. m.
San Francisquito	April 9, 2:16 p. m.	April 10, 6:50 a. m.
Angel de la Guardia	April 10, 12:18 p. m.	April 11, 8:40 a. m.
Tiburon	April 11, 3:11 p. m.	April 13, 10:55 a. m.
San Estaban	April 13, 1:02 p. m.	April 14, 8:30 a. m.
Guaymas	April 15, 12:08 a. m.	April 15, 6:00 p. m.
Santa Catalina Island	April 16, 9:10 a. m.	April 16, 11:67 a. m.
Santa Cruz Island	April 16, 3:10 p. m.	April 16, 5:19 p. m.
Pichilinque	April 17, 4:50 a. m.	April 19, 6:30 a. m.
Espiritu Santo Island	April 19, 9:19 a. m.	April 19, 12:35 p. m.
Ceralbo Island	April 19, 3:50 p. m.	April 19, 5:58 p. m.
San José del Cabo	April 20, 6:10 a. m.	April 20, 9:63 a. m.
San Bartolomé Bay	April 23, 5:17 a. m.	April 23, 10:00 a. m.

J. N. ROSE.

CONFERENCE NOTES.

The first of the autumn conferences was held in the library on Monday, November 7, Dr. N. L. Britton presiding.

Dr. E. D. Clark discussed the results of work on the soluble substances in soils resulting from exposure to dry heat, which study is a continuation of work reported last year.* The following is a synopsis of the paper prepared by Dr. Clark. In these later studies we have extended to the higher plants our observations on the effects of heated soils upon the growth of fungi. We had previously noticed that the color of soil extracts seemed to vary with the temperature to which the soil had been subjected, the higher temperatures causing darker extracts. With this suggestion we carried out experiments showing that upon analysis the darker extracts contained much more soluble matter than those of lighter color. In other words, the amount of matter made soluble by heat depended upon the intensity of the heat and to this, the color of the extract served as an index. The highly colored extracts always proved favorable as a medium for *Pyronema* and other fungi. On the other hand, experiments with lupine seedlings indicated that they were affected in an unfavorable way by the heated-soil extracts, especially by those from soils exposed to high temperature and consequently having much material in solution. Those extracts most favorable to the growth of fungi were most unfavorable to the growth of green plants.

Oats were sown on a series of soils already exposed to different temperatures and the effects of the various soils noted. The soils which were heated to 90° C. and 120° C. seemed to show slight stimulation of growth over that of the control on unheated soil. However, the soils heated to 150° C. and 170° C. had a marked inhibiting action upon the oat seedlings.

Coville has found that certain plants such as the blueberry, etc., are lovers of acid bog-soils and only reach their best development under such conditions. We wish to determine whether the

* Studies in Pyrophilous Fungi—II. Changes brought about by the heating of soils and their relation to the growth of *Pyronema* and other fungi. Mycologia 2: 109–124. 1910.

better growth of these plants on burned-over areas is due to the greater amount of soluble matter of an acid nature produced by heat. We also expect to study more carefully the nature of the soluble organic matter and its effect upon the cells of green plants.

Mr. A. B. Stout presented in part the results of his studies on the fungus *Sclerotium rhizodes*, a report of which will soon appear as a research bulletin of the Wisconsin Experiment Station.

This fungus has been found in Wisconsin on eleven species of grasses: *Phalaris arundinacea; Calamagrostis canadensis; Calamagrostis neglecta; Poa pratensis; Panicularia nervata; Phleum pratense; Hordeum jubatum; Bromus ciliatus; Eatonia pennsylvanica, Agropyron caninum* and *Agrostis hyemalis*. Infected specimens of all these grasses were displayed.

Special point was made of the character of the fungus in the different organs of the host plant. The fungus is coexistent in leaves, buds, stems, rhizomes and roots of the same plant. In the leaves it is vigorously parasitic, in the buds and stems it is less so and in the roots it assumes characters usually attributed to endotropic mycorrhiza.

The morphological and cytological evidence, however, indicates that the action of the mycelium in individual root cells is parasitic.

The mycelium is perennial in the soil and in the underground parts of the plant and so far as known the mycelium is sterile.

The report aimed to present only those phases of the study which could be demonstrated by the herbarium specimens and the microscopic preparations which were shown.

Dr. N. L. Britton exhibited a specimen of *Cereus hexagonus* just coming into flower and remarked on the generic character of the perianth being deciduous from the top of the ovary; in most related genera it is withering-persistent.

A. B. Stout.

NOTES, NEWS AND COMMENT.

Dr. J. A. Shafer recently spent several days at the Garden on his way to the West Indies where he will continue his botanical explorations in Cuba.

Mr. W. W. Eggleston spent several days at the Garden in November in continuation of his studies on *Crataegus* and *Malus*.

Professor R. A. Harper is conducting a series of seminars for the benefit of the graduate students of Columbia University, the subject considered being the reproduction of the higher fungi. The first of the series which was held in the main laboratory of the Garden, Saturday, November 4, consisted of an introduction covering the earliest literature of the subject.

Dr. Mel. T. Cook, formerly a research student at the Garden, has resigned his position as pathologist in Delaware Agricultural College to accept a similar position in Rutgers College, New Jersey.

Mr. Norman Taylor, curator at the Brooklyn Botanic Garden, is continuing his studies on the local flora at the Garden.

The squirrels of Bronx Park seem in the last year or two to be taking after strange gods in the food line. This may of course be due merely to the fact that the writer has never before happened to observe them eating the foods here mentioned, though they may have been a common enough diet. On the other hand, it may well be caused by the lack of chestnuts brought about by the ravages of the chestnut disease. At any rate, a squirrel has on several occasions been seen making a meal of oats which had fallen from the feed-bag of some horse. Another has been seen eating the seeds of the sweet-gum (*Liquidambar Styraciflua* L.). In either case, if the eater finally succeeded in reaching the state where his hunger was satisfied, it must be admitted that he deserved all the bliss he found there.—*E. D. Humphreys.*

Meteorology for November.—The total precipitation for the month was 4.52 inches of which .77 inch fell as snow on the night following the 14th. There were 17 clear days during the month. The maximum temperature recorded for the month was 67° on the 12th. Other high temperatures were recorded of 62° on the 7th, 53° on the 5th, 56° on the 18th and 50° on the 26th. The minimum temperature recorded for the month was 21° on the 22d. Other low temperatures were recorded of 24° on the 17th and 14th and 28° on the 9th and 3d.

ACCESSIONS.

MUSEUMS AND HERBARIUM.

15 specimens of mosses from North America and the Old World. (By exchange with Mr. Jules Cardot.)

1 specimen of *Pinus rigida* from Long Island, New York. (Given by Dr. N. L. Britton.)

25 specimens "Ustilagineen," fascicle XI. (Distributed by Professors H. & P. Sydow.)

1 specimen of fungus from Maryland. (By exchange with Dr. C. L. Shear.)

2 specimens of fungi from Colorado. (Given by Professor Ellsworth Bethel.)

42 specimens of fungi from Montana. (By exchange with Professor J. C. Arthur.)

1 specimen of *Viola retusa*. (Given by Professor Ezra Brainerd.)

208 specimens of algae from the Philippine Islands. (By exchange with the Bureau of Science, Manila.)

1 specimen of *Citrus* from Europe. (Given by the Portugese Synagogue, New York.)

2 specimens of hepatics from Connecticut. (Given by Dr. Alexander W. Evans.)

1 specimen of *Mazus rugosa* from Louisiana. (Given by Professor R. C. Cocks.)

50 specimens "Uredineen," fascicle 48. (Distributed by Professors H. & P. Sydow.)

LIBRARY ACCESSIONS FROM JULY 1 TO OCTOBER 31, 1911.

(CONCLUDED.)

BAUER, ERWIN. *Einführung in die experimentelle Vererbungslehre.* Berlin, 1911.

BENARY, ERNST. *Die Erziehung der Pflanzen aus Samen. Ein Handbuch für Gärtner, Samenhändler und Gartenfreunde.* Ed. 2. Berlin, 1911.

BURGEFF, HANS. *Die Anzucht tropischer Orchideen aus Samen.* Jena, 1911.

CZAPEK, FRIEDRICH. *Über eine Methode zur directen Bestimmung der Oberflächenspannung der Plasmahaut von Pflanzenzellen.* Jena, 1911.

ERRERA, LÉO. *Recueil d'oevres. Physiologie générale. Philosophie.* Brussels, 1910. (Given by Madame Léo Errera.)

FOERSTER, KARL. *Winterharte Blütenstanden und Sträucher der Neuzeit.* Leipzig, 1911.

GERTH VAN WIJK, H. *A dictionary of plant names.* The Hague, 1911.

GÜNTHART, EMIL AUGUST. *Prinzipien der physikalish-kausalen Blütenbiologie in ihrer Anwendung . . . des Blüten-apparatus der Cruciferen.* Jena, 1910.

HAECKER, VALENTIN. *Allgemeine Verberbungslehre.* Braunschweig, 1911.

HOERNES, RUDOLF. *Das Aussterben der Arten und Gattungen sowie der grösseren Gruppen des Tier- und Pflanzen-reiches.* Graz, 1911.

KIRCHNER, EMIL OTTO OSKAR. *Blumen und Insecten. Ihre Anpassungen aneinander und ihre gegenseitige Abhängigkeit.* Leipzig, 1911.

KRAUS, GREGOR. *Boden und Klima auf kleinsten Raum. Versuch einer exakten Behandlung des Standorts auf dem Wellenkalb.* Jena, 1911.

LANDSBERG, BERNHARD. *Didaktik des botanischen Unterrichts.* Leipzig, 1911.

MASSART, JEAN. *Esquisse de la géographie botanique de la Belgique.* (With annex.) Bruxelles, 1910.

MEYER, TH. *Arzneipflanzenkultur und Kräuterhandel. Eine Anleitung für Apotheker, Landwirte und Gärtner.* Berlin, 1911.

RICKEN, ADELBERT. *Die Blätterpilze Deutschlands und der angrenzenden Länder, besonders Oesterreichs und der Schweiz.* Leipzig, 1910.

ROTH, GEORG. *Die aussereuropäischen Laubmoose.* Parts 1–4. Dresden, [1910–11].

RÜMKER, KURT H. VON, & TSCHERMAK, ERICH VON. *Landwirtschlaftliche Studien in Nordamerika mit besonderer Berücksichtigung der Pflanzenzüchtung.* Berlin, 1910.

UPHOF, J. C. TH. *Die Pflanzengattungen. Geographische Verbreitung, Anzahl und Verwandschaft aller bekannten Arten und Gattungen im Pflanzenreich.* Leipzig, 1910.

WAGNER, ADOLF. *Die fleischfressenden Pflanzen.* Leipzig, 1911.

WEHMER, CARL. *Die Pflanzenstoffe. Botanisch-systematisch Bearbeitet.* Jena 1911.

WILHELM, KARL. *Die Samenpflanzen. Systematische Übersicht ihrer Familien und wichtigeren Gattungen und Arten.* Wien, 1910.

ZOPF, FRIEDRICH WILHELM. *Die Pilze in morphologischer, physiologischer, biologischer und systematischer Beziehung.* Breslau, 1890.

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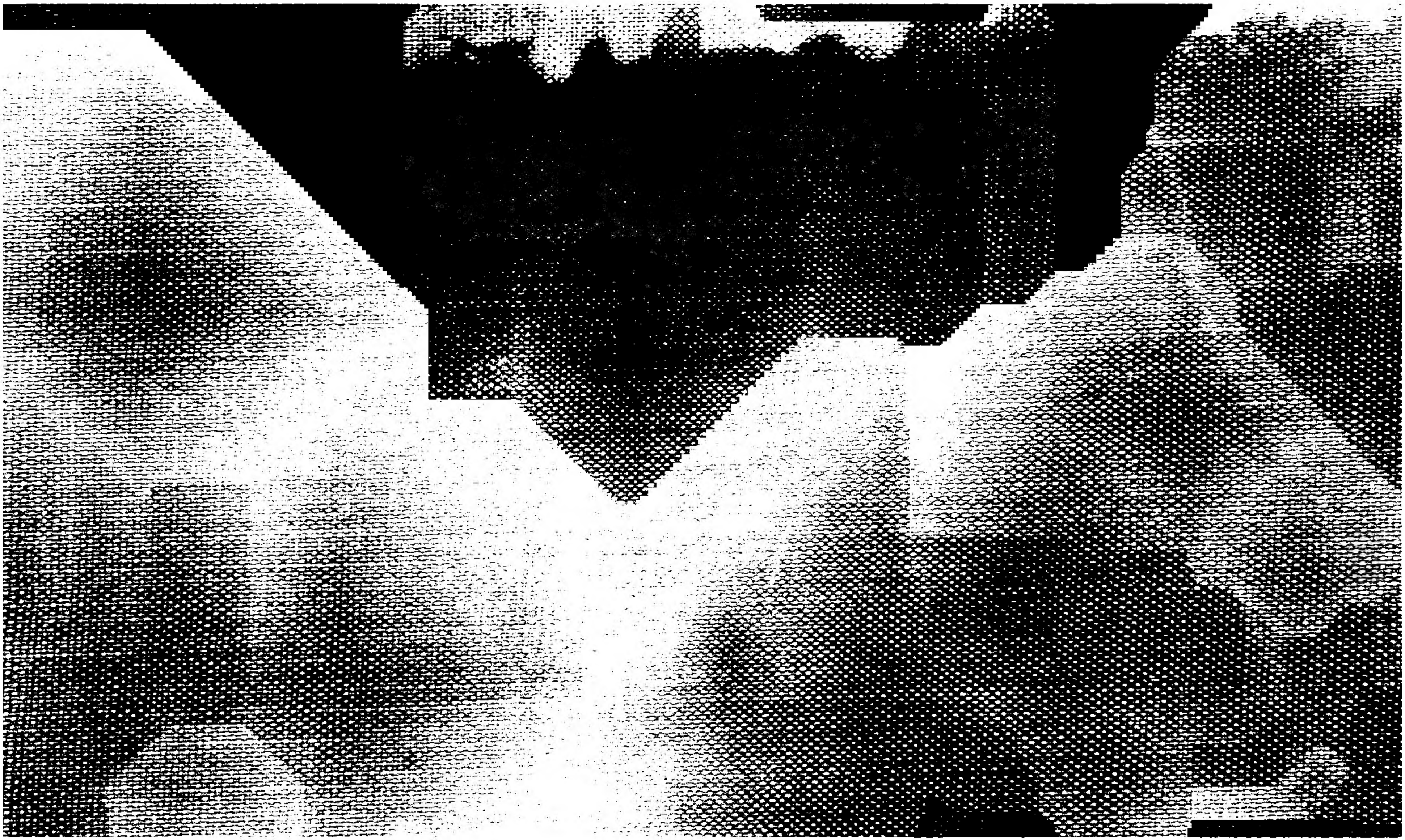
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